Healthcare Knowledge, Practices and Stress

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Printed in USA

First Edition Published in 2023

AJPO Journals and Books Publishers

journals@ajpojournals.org

https://ajpojournals.org

European Journal of Health Sciences

ISBN:

Vol 5 No 2 (2020)

Table of Contents

Preconception Knowledge and Practices among Women in Fertility Age in the Tamale Teaching Hospital of Ghana

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Abstract

Purpose: The aim of this study was to assess preconception knowledge and practices and its effect on birth outcomes among puerperal women in the Tamale Teaching Hospital.

Methodology: The study employed analytic cross-sectional study design with a quantitative approach. A semi-structured questionnaire was used where questions on knowledge of preconception were adopted from Southampton Women's Survey, 2006. Puerperal women in the postnatal unit of the Tamale Teaching Hospital, who were yet to be discharged, including referred cases, were selected as target population for this study. The exclusion criteria were women who have never delivered and menopausal women. The sample size was 363 puerperal women. Purposive sampling method was used to attain the required sample. Data was analyzed using SPSS version 25. In the analyses, a p-value<0.05 was considered statistically significant when variables were cross-tabulated.

Findings: The results of the study revealed a high proportion of puerperal women 161 (44.3%) were above 30 years. The mean age was 30.56±6.44 years. The study found that 37.2% women had knowledge on preconception care. There was a significant association between folic acid intake and postpartum haemorrhage (r=-0.183, p<0.0001). There was no statistical association between birth outcomes and concurrent loss of pregnancy and number of pregnancies lost except for birth weight (r=0.202, p=0.000). Albeit preconception care knowledge was low among puerperal women, it significantly influenced postpartum haemorrhage and pregnancy induced hypertension but not antepartum hemorrhage and birth weight.

Unique Contribution to Theory, Practice and Policy: At the community level the study recommended to the Ghana Health Service that a mother-to-mother support group be formed among women in their reproductive age and this could help encourage one another to discuss about their health before pregnancy and share success stories on birth outcomes and report to the facility in case of any problems.

Keywords: *Preconception, Knowledge, Practices, Tamale Teaching Hospital*

INTRODUCTION

The expansion of access to preconception knowledge and counseling among women in fertility age is proposed as a strategy for achieving progressive women's health as captured in the third Sustainable Development Goal (Chuang, Velott, & Weisman, 2010). Preconception care involves provision of biomedical, behavioral and social health interventions to women and couples before conception occurs, aimed at improving their health status, reducing behaviours and individual and environmental factors that could contribute to poor maternal and child health outcomes (Al-Akour, Sou'Ub, Mohammad, & Zayed, 2015; Harelick, Viola, & Tahara, 2011).

Maternal, newborn and child health (MNCH) care approach is important during the preconception period since the health and well-being of women, newborns and children are closely linked and ought to be managed in a unified manner (Kinney et al., 2010). The achievement of MNCH include interventions directed at improving nutritional status through balanced energy-protein supply, folic acid supplementation/fortification, micronutrient supplementation among others and maintaining healthy lifestyle (Frey & Files, 2006; Gunaratna et al., 2015; Lassi, Dean, Mallick, & Bhutta, 2014).

Preconception care includes a set of interventions that aims to identify and modify biomedical, behavioural and social risks to women's health or pregnancy outcome through prevention and management (Seshadri, Nelson-Piercy, & Chappell, 2012). This statement was affirmed by the World Health Organization (WHO) which added that the ultimate aim of preconception care is to improve maternal and child health, in both the short and long term (WHO, 2013). It is, therefore, an essential and vital practice, as it lays the foundation for future health of the mother, her child and her family (Mitchell, Levis, & Prue, 2012). Besides, it is an ongoing component of healthcare services that must be provided for both men and women in their reproductive age to ensure that they are healthy (WHO, 2013). In view of this the act of embracing preconception care serves as a golden opportunity that can identify health risk factors in pregnancy and enable healthcare givers to conduct any required interventions earlier before pregnancy occurs to prevent harmful exposures from affecting the developing foetus (Dandekar & Hessler, 2014; Kinney et al., 2010; Mittal et al., 2016).

These interventions include birth spacing and prevention of teenage pregnancy as young mothers often are not physically mature enough to deliver a baby, leaving them and their children at risk for death or disability from obstructed

labor, fistulas, premature birth, or low birth weight. At the same time, early childbearing negatively affects educational and economic opportunities; women with lower educational attainment have greater risks of adverse pregnancy outcomes, are less knowledgeable about health-prevention activities, and family planning. Their children have fewer options for education, optimal growth and development and have a higher risk of mortality (Lassi et al., 2014). Seshadri et al. (2012) were right when their study concluded that preconception care was interventions characterized by the need to start and sometimes complete a designated intervention before conception occurs.

Preconception care knowledge and practices could have multiple positive impacts on birth outcomes as its ultimate aim is to improve maternal and child health, in both the short and long term. This was to reiterate the World Health Organization's assertion that there is widespread consensus that to reduce maternal and childhood mortality, a continuum of care needs to be provided through pregnancy, childbirth, the postnatal period (addressing both mothers and infants), infancy, childhood, adolescence and adulthood. There is also widespread agreement that actions are needed at the community, primary care and referral care level to deliver this continuum of care (WHO, 2013).

Preconception knowledge of women is focused on women's ability to identify medical and social conditions that may put the mother or fetus at risk. Therefore, the notion of preconception knowledge among women aims to provide understanding to the existing risks before pregnancy, whereby resources may be used to improve reproductive health of women, men and couples in order to optimize health and knowledge before conceiving a pregnancy (Ojukwu, Patel, Stephenson, Howden & Shawe, 2016).

Counseling administered to influence knowledge and attitudes about preconception and its effects on a potential pregnancy is shown to manifest large impact (Mittal, Dandekar, & Hessler, 2014). It is therefore important to note that a reproductive life plan is a brief, cost effective preconception and contraception counseling tool in the primary care setting for women. This means that increasing knowledge about reproductive health is incomplete when preconception knowledge is not present. In view of this lack of knowledge about common preconception risk factors seems to be one of the critical factors hindering the widespread application of the practice.

In a population study in Rotterdam, half of the non-pregnant study population (n=631) were unaware of the adverse effect of smoking and being overweight

on fertility. Although, this outcome is in contrast with other results, specific preconception health knowledge, e.g., folic acid use, was also scarce ($p<0.001$) (Gunaratna et al., 2015). Notwithstanding, several studies have shown that there is positive correlation between women's preconception care knowledge and effective reproductive health outcomes (Singh et al., 2010).

In terms of preconception practices, Stephenson and colleagues (2014) reported that despite the high level of pregnancy planning in their survey of not less than 1000 sample size in three North London hospitals, and previous miscarriage, stillbirth or termination for fetal abnormalities, 34% of all women reported acquiring no information about preconception health behaviours and 49% reported no practice of preconception care knowledge. Just over half (51%) of all women, and fewer than two thirds (63%) of women with planned pregnancies, took folic acid before pregnancy.

Since maternal assessment before pregnancy encompasses family history, obstetric history and general physical examination of the potential mother; family history of chronic disorders, firstdegree consanguineous (relationship by descent) marriages and planning pregnancy has been shown to be associated with awareness of preconception care. It was reported by Al-Akour and colleagues (2015) in their study on awareness of preconception care among women and men from Jordan that close to 50% of participants were aware of the serious impact that a woman's and man's family history can have on the health of their babies. They concluded that a significant number of their respondents recommended changes be made prior to conception.

Though the world has made significant improvement in saving the lives of mothers and children since the adoption and implementation of major programmes such as the Millennium Development Goals 4 and 5 in 2000 (Gunaratna et al., 2015), there were still 287,000 maternal and 2.9 million newborn deaths each year, with an additional 2.6 million stillbirths worldwide (UNICEF, 2010). However, data from the Tamale Teaching Hospital (TTH) showed that the dynamics of specific maternal and neonatal health outcomes are not pointing in the right direction. For instance, the prevalence of still birth decreased slightly from 313 to 251 between 2015 and 2016, it later hiked to 342 in 2017 and further increased to 379 in 2018; low birth weight increased from 1516 to 1708 between 2015 and 2016 but reduced from 2098 to 1602 from 2017 to 2018.

Antepartum hemorrhage (APH), postpartum hemorrhage (PPH) and pregnancy induced hypertension (PIH) was also rife in 2015 where 58,101 and

257 was recorded respectively. Despite data on APH and PPH were lacking in 2018, PIH which was available indicated massive increase of 52 cases from the previous year (2017) (Source: TTH Data – 2015, 2016 & 2017). The information, however, gathered may be due to poor preconception knowledge among women**.**

Notwithstanding, little has been done to examined women's knowledge and health behaviors before and after receipt of targeted preconception education and counseling in Ghana. Besides, the prevalence of the problems associated with ineffective preconception knowledge on the part of the reproductive age woman in the country remains unclear. More so, lack of preconception knowledge is an assumed contributor to several causes of poor pregnancy outcomes most especially in the Northern sector of the country. As Frey and Files (2006) have observed that the concept of preconception care has been articulated for a long time, but unfortunately have not become part of the routine practice especially knowledge and practices on preconception care among reproductive age women. It is in the light of this that this study intended to determine the knowledge level and practice of preconception among reproductive age women in the Tamale Metropolis of Ghana.

METHODOLOGY

The study employed analytic cross-sectional study design with a quantitative approach. The study was conducted at the Tamale Teaching Hospital in the Tamale Metropolis in the Northern Region of Ghana. A semi-structured questionnaire which has both open-ended and close-ended questions was used for data gathering. Questions on knowledge of preconception were adopted from Southampton Women's Survey (2006).

Puerperal women in the postnatal unit of the Tamale Teaching Hospital, who were yet to be discharged, including referred cases, were selected as target population for this study. The exclusion criteria were women who have never delivered and menopausal women. The sample size was 363 puerperal women. Purposive sampling method was used to attain the required sample size. The participants were recruited during their early puerperal stage. Data was analyzed using SPSS version 25, and represented by frequencies and percentages. In the analyses, a p-value<0.05 was considered statistically significant when variables were cross-tabulated.

FINDINGS

Socio-Demographic Characteristics

The most represented age category of puerperal women was above 30 years (44.3%), followed by the 25 to 30 years group (40.5%) and 15.2% were less than 25 years. The mean age was 30.56±6.44 years. More than three fourth (84.8%) of the respondents were married and almost 75% had formal education, but 24.8% of their partners had no formal education. Almost half (49.6%) of the respondents were Muslims and 42.1% of them were Dagombas. Whiles respondents' partners were predominantly public/civil servants (49.0%), the data showed 35.5% women were petty traders. Most of them (66.1%) also resided in the urban area of the Tamale Metropolis. Table 1 below gives detail of the background of respondents.

Table 1: Socio-Demographic Characteristics of Respondents (N=363)

Background information	Frequency (N)	Percentage (%)
Age		
<25	55	15.2
25-30	147	40.5
>30	161	44.3
Mean ±standard deviation of age	30.56±6.44	
Marital status		
Single	36	9.9
Married	308	84.8
Co-habitating	18	5.0
Divorced	1	.3
Maternal educational status		
No formal education	91	25.1
Primary	32	8.8
JHS	44	12.1
SHS/Vocational	64	17.6
Tertiary	132	36.4
Educational status of partner		
No formal education	90	24.8
Primary	21	5.8
JHS	33	9.1
SHS/Vocational	36	9.9
Tertiary	179	49.3
Others (missing due to divorce or death)	4	1.1
Religion		
African Tradition	21	5.8
Islam	180	49.6
Christianity	162	44.6
Tribe		
Dagomba	153	42.1
Gonja	53	14.6
Mamprusi	33	9.1
Akan	79	21.8
Others (Frafra, Ewe, etc.)	45	12.4

Source: Field Data, 2019

Table 2: Socio-Demographic Characteristics of Respondents (N=363) – Cont'd

Background information	Frequency (N)	Percentage (%)
Occupation of woman		
Farming	55	15.2
Petty trading	129	35.5
Public/civil servant	135	37.2
Others (seamstress, charcoal burning etc.)	44	12.1
Occupation of partner		
Farmer	91	25.1
Petty trading	55	15.2
Public/civil servant	178	49.0
Others (drivers, butchers, etc.)	25	6.8
Missing (due to divorce, etc.)	14	3.9
Residence		
Urban	240	66.1
Rural	123	33.9

Source: Field Data, 2019

Maternal Obstetric History

When the gestational age at birth was assessed, it was realized that higher percentage (76%) (276/363) of the respondents delivered between 36 to 40 weeks, the post term women were 19.3% of the respondents, and the preterm group 4.7%.

On maternal obstetrics characteristics, majority of the respondents (69.7%) had more than one live birth (multiparous) whiles about 30.3% were primiparous (single parity). More so, it was found among the 64 women who claimed to have lost a pregnancy, 76.6% had a single pregnancy lost, 10 (15.6%) had lost two pregnancies, whiles 7.8% had lost three. Pregnancies that were lost within the first six months after conception represented 87.5% of the respondents. It was found that all birth outcomes recorded was significantly associated with parity, there was no association between the outcome variables and concurrent loss of pregnancy and number of pregnancies lost except for birth weight (r=0.202, p=0.000). Table 2 highlights the details of the above information.

Table 3: Maternal Obstetrics Characteristics (N=363)

Variables	N (%)		Pregnancy outcomes (*r*, p-value)		
		PPH	APH	PIH	Birth weight
Parity					
Primiparous	110 (30.3%)	-0.121, 0.021	0.110, 0.037	-0.125, 0.017	0.202, 0.000
Multiparous	253 (69.7%)				
Ever lost pregnancy					
Yes	64 (17.6%)	-0.003, 0.953	-0.004, 0.937	-0.010, 0.846	-0.003, 0.953
No	299 (82.4%)				
Number of pregnancies lost	N=64				
One	49 (76.6%)				
Two	10 (15.6%)	-0.042, 0.738	-0.042, 0.738	0.116, 0.356	0.202, 0.000
Three	5 (7.8%)				
Month at which baby was lost					
At least six months	56 (87.5%)				
More than six months	8 (12.5%)	0.047, 0.711	-0.047, 0.738	0.116, 0.356	-0.024, 0.852
Mode of delivery					
**SVD	288 (79.3%)	0.037, 0.476	0.028, 0.590	0.010, 0.848	0.004, 0.940
**C/S	75 (20.7%)				

Source: Field Data, 2019

**Key

C/S=Caesarian Section

SVD=Spontaneous Vaginal Delivery

Knowledge of Puerperal Women on Preconception Care

When respondents were asked if they had heard of preconception care, 37.2% (n=135/363) claimed to have heard about it, whiles majority 228 (62.8%) denied any hearing of preconception care. However, when the respondents were asked to describe preconception care, 77.0% of the respondents who claimed to have heard of preconception care said it is the preparation and care given to women by health workers before pregnancy. A few (11.9%) said it is care given to pregnant women and those who stated knowledge of women on conception represented 11.1%.

In view of this the respondents' idea on preconception health was assessed to evaluate their knowledge. Majority of the respondents (78.2%) knew it was important to live a healthy life before conception with a 211 of the participants acquiring the information from health workers among other sources. A little more than half of the respondents (50.7%) did not know that folic acid and vitamin supplements were significant for a successful pregnancy. This is shown in Table 3.

Table 3: Knowledge on Preconception Health (N=363)

Question	Response Rate (N=363)	
	Yes (%)	No (%)
Good health life before conception important for you and the baby	284 (78.2%)	79 (21.8%)
Source of information on the importance of good health before conception		
- Health worker	211 (74.3%)	-
- Family/Friend	21 (7.4%)	-
- Radio/TV	22 (7.7%)	-
- School	27 (9.5%)	-
- Pharmacist	3 (1.1%)	-
Folic acid and vitamin supplements were good for conception	179 (49.3%)	184 (50.7%)

Source: Field Data, 2019

Observation from the above data showed that the study's participants tended to have a fair knowledge on preconception care. However, the correlation between knowledge on the importance of folic acid and vitamin supplements in pregnancy and birth outcomes showed no significant relationship, except PPH which showed a strong correlation (r=-0.183, p=0.000). This is shown in Table 4.

Table 4: Bivariate Analysis between Knowledge on the Importance Folic Acid and Birth Outcomes

Variables	Knowledge on Folic acid and Vitamin supplements		*r*, p-value
	Yes (%)	No (%)	
Maternal birth outcome			
PPH	99 (27.3%)	264 (72.7%)	-0.183, **0.000**
APH	35 (9.6%)	328 (90.4%)	0.014, 0.793
PIH	100 (27.5%)	263 (72.5%)	-0.09, 0.086
Child birth outcome	**N**	**(%)**	
Low birth weight	48	13.2	
Normal birth weight	302	83.2	-0.043, 0.412
Macrosomia	13	3.6	

Source: Field Data, 2019

Association between Preconception Care Knowledge and Birth Outcomes

The study found 27.3% prevalence of PPH, 9.6% of APH and 27.5% PIH among the puerperal women. Bivariate analysis of correlation between knowledge on preconception care and PPH showed an inverse relation, implying that as maternal knowledge on preconception care increases, the prevalence of PPH decreases, whiles PPH would decrease among women with high knowledge level on preconception care on the other hand (r=-0.138, p=0.008). This observation was different in APH women where there was no significant association with preconception care knowledge showed by Pearson r of 0.00. Similarly, there was no significant relation to the birth weight of neonates, but the association between the independent variable and PIH was significant showing inverse relation (r=-0.104, p=0.047). This is shown in Table 5.

Table 5: Association between Preconception Care Knowledge and Birth Outcomes

Variables	Knowledge on preconception care among women (N=363)		*r*, p-value
	Yes (%)	No (%)	
Maternal birth outcomes			
PPH	99 (27.3%)	264 (72.7%)	-0.138, **0.008**
APH	35 (9.6%)	328 (90.4%)	0.000, 0.995
PIH	100 (27.5%)	263 (72.5%)	-0.104, **0.047**
Childbirth outcomes	**N**	**(%)**	
Low birth weight	48	13.2	
Normal birth weight	302	83.2	-0.04, 0.412
Macrosomia	13	3.6	

Source: Field Data, 2019

Practices of Preconception Care

In terms of practice on preconception care, 73.8% did not modify their diet before conception, alcoholic beverages consumption before conception was a little higher than smoking among women. More than half of the respondents (51.2%) were screened for either STIs or genetic disorders before conception, whiles 79.3% sought for fertility advice. Though 77.4 % haltered the use of contraception before they conceived, surprisingly, 90.6% continued to use caffeinated products.

When it comes to preparations made before pregnancy, it was detected that out of the 363 respondents, 37.5% (n=136/363) prepare for their pregnancies whiles the 62.5% made less attempts to prepare for their pregnancies. For those who prepare before conception, 7.4% sought preconception care services, 38.9% claimed to purchase their materials or items in wait for the unborn baby and themselves, and 18.4% took folic acid as a vitamin supplement among other responses. Table 6 shed light on the preconception practices.

Table 6: Preconception Practices among Pregnant Women

Variables	Response Rate (N=363)	
	Yes (%)	No (%)
Practices by respondents		
Modified diet	95 (26.2%)	268 (73.8%)
Took steps to change weight	120 (33.1%)	243 (66.9%)
Consumed alcohol	12 (3.3%)	351 (96.7%)
Smoking	9 (2.5%)	354 (97.5%)
Vaccinated against infectious diseases	148 (40.8%)	215 (59.2%)
Screened for STIs and genetic disorders	186 (51.2%)	177 (48.8%)
Dental checks	38 (10.5%)	325 (89.5%)
Used contraceptives	82 (22.6%)	281 (77.4%)
Sought fertility advice	75 (20.7%)	288 (79.3%)
Stopped caffeine intake	34 (9.4%)	329 (90.6%)
Preparations made before conception	**N (%)**	-
Financial preparation	22 (16.2%)	-
Folic acid intake	25 (18.4%)	-
Halt contraception	6 (4.4%)	-
Healthy diet intake	11 (8.1%)	-
Purchase items	53 (38.9%)	-
Medical checkups	7 (5.1%)	-
Moderate activities	2 (1.5%)	-
Seek for preconception care	10 (7.4%)	-
Total	**136 (100%)**	

Source: Field Data, 2019

Critically looking at the data above on the practices on preconception by the respondents of this study, majority gave negative responses pointing to the fact that their answers were wrong as against the few who replied in the affirmative. However, 53 (38.9%) out of the 136 respondents purchased household items as a means of preparing towards conception with few (5.1%) having medical checkups and preparing financially (16.2%) before conception. Consequently, these assertions pointed to the fact that participants for this study had poor practices of preconception care.

When the participants' preparedness for conception was cross-tabulated against maternal and child birth outcomes respectively, the findings had no statistical association among the variables. This is shown in Table 7 below.

Table 7: Association between Preparations Made before Pregnancy and Birth Outcomes

Birth Outcomes	Response Rate (N=363) Preparedness for conception		Test-statistic
	Yes	No	*r*, p-value
Maternal birth outcomes			
PPH	99 (27.3%)	264 (72.7%)	-0.078, 0.139
APH	35 (9.6%)	328 (90.4%)	-0.060, 0.254
PIH	100 (27.5%)	263 (72.5%)	-0.095, 0.070
Childbirth outcome	**N**	**%**	
Low birth weight	48	13.2	-0.044, 0.398
Normal birth weight	302	83.2	
Macrosomia	13	3.6	

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Discussion

The study assessed the preconception knowledge and practices among women in fertility age in the Tamale Teaching Hospital of Ghana. When participants of the study were asked if they had heard of preconception care as part of evaluating their knowledge, 37.2% (n=135/363) claimed to have heard about it, whilst majority 228 (62.8%, n=363) denied any hearing of preconception care. This report was in agreement with Al-Akour and colleague's (2015) study that indicated 50% of their participants showed awareness of preconception care among women and men. More so, 74.3% (n=211/263) of this research had their information on the importance of good health before conception from the health worker; contrary to this view, only 34% of all women reported acquiring no information about preconception health behaviours (Stephenson et al., 2014).

Mittal and colleagues (2014) said knowledge about preconception care and its effects on a potential pregnancy manifests large impact. Gunaratna and colleagues (2015) reported that lack of knowledge about common preconception care seems to be one of the critical factors hindering widespread application of the practice and consequently having negative impacts ($p<0.001$). However, 78.2% of the participants of this study knew it was important to live a healthy life before conception.

In terms of description of preconception care, 77.0% of this study respondents said it is the preparation and care given to women by health workers before pregnancy. A few (11.9%) described it as care given to pregnant women. This implied that some of the respondents were of the view that preconception care is the same as antenatal care. It was, therefore, explained in another study that preconception care was interventions characterized by the need to start and sometimes complete a designated intervention before conception occurs (Seshadri et al., 2012). In conclusion, preconception care is the provision of biomedical, behavioural and social health interventions to women and couples before conception occurs aiming at improving their health status, and reducing behaviours and individual and environmental factors that contribute to poor maternal and child health outcomes. Its ultimate aim, therefore, is to improve maternal and child health, in both the short and long term (WHO, 2013).

As part of the practices made towards preconception care, women are to make preparations prior to conception. Among this study's participants, 39% of them purchased household items for the baby and themselves, whilst 18.4% took folic acid and other vitamin supplements, 16.4% made financial preparations towards their conception, and 7.4% sought preconception care. These findings were in agreement by a comment that suggested that resources may be used to improve reproductive health of women, men and couples in order to optimize health and knowledge before conceiving a pregnancy (Ojukwu et al., 2016). However, the idea of practicing preconception care has not been a concept acknowledged among most reproductive age women (Frey & Files, 2006).

Conclusion

Women in fertility age attending the Tamale Teaching Hospital in the Northern Region of Ghana tended to have a fair knowledge and poor practices on preconception care.

Recommendations

i At the community level the study recommended to the Ghana Health Service (GHS) that a mother-to-mother support group be formed among women in their reproductive age and this could help encourage one another to discuss about their health before pregnancy and share success stories on birth outcomes and report to the facility in case of any problems.

ii The knowledge gap of preconception care in this part of the country requires the Ministry of Health, and the GHS in particular, to put in place at the various health delivery levels, including encouraging

women in their reproductive age to seek information about their health and impending pregnancy.

iii Preconception care needs to be integrated into other social services, such as the adolescent reproductive health services, and/or social franchises for easy accessibility to practice but not only assigning to healthcare providers as their duty at the health post.

iv Women and children protecting agencies, such as the Ministry of Gender, Children and Social Protection in collaboration with the GHS, should publish more information on the need to seek preconception care before conception.

Emerging Issues and Controversies

According to Asumadu et al (2020), many women in fertility age in Ghana, particularly in rural areas, lack access to comprehensive preconception education. This leads to limited knowledge about the importance of preconception health and the steps needed to optimize it. Also, The Tamale Teaching Hospital and healthcare facilities in other parts of Ghana face challenges in terms of infrastructure, personnel, and resources. This can hinder their ability to provide adequate preconception care and counseling.

Secondly, Traditional beliefs and practices in Ghana may influence women's preconception knowledge and behaviors (Dako-Gyeke et al 2013). For example, some cultural practices may discourage family planning or encourage early childbearing, which can impact preconception health. Also, Socioeconomic disparities can affect access to preconception care. Women from lower-income backgrounds may have limited access to healthcare services, which can affect their preconception knowledge and practices. Again, in some communities, infertility is stigmatized, which may lead women to avoid seeking preconception care and support. This can have negative consequences on their overall reproductive health.

Additionally, Preconception health is not solely the responsibility of women; it involves both partners (Johnson et al 2006), There may be limited male involvement in preconception care and decision-making, which can impact the overall health of the couple. Also, many women may not be aware of the importance of a balanced diet and proper nutrition before conception. Poor dietary choices can lead to nutritional deficiencies and increase the risk of birth defects and maternal complications.

Final, Access to contraception and family planning services is crucial for ensuring that women can plan their pregnancies when they are physically and emotionally ready (Kavanaugh and Anderson, 2013). Limited access to these services can lead to unintended pregnancies and inadequate preconception preparation. Also, the mental health of women in fertility age is often overlooked in preconception care. Stress, anxiety, and depression can impact fertility and pregnancy outcomes, highlighting the need for mental health support.

Addressing these emerging issues and controversies on preconception knowledge and practices among women in fertility age in the Tamale Teaching Hospital of Ghana requires a multi-faceted approach, including improved

healthcare infrastructure, culturally sensitive education, increased male involvement, and efforts to address socioeconomic disparities. Additionally, promoting awareness about the importance of preconception health and comprehensive care is essential to ensuring the well-being of women and their future children.

REFERENCES

Al-Akour, N., Sou'Ub, R., Mohammad, K., & Zayed, F. (2015). Awareness of preconception care among women and men: A study from Jordan. *Journal of Obstetrics and Gynaecology, 35*(3), 246-250.

Asumadu, O. K. D., Effrim, S. E., Ennin, B., Amoabeng, A. O., Darcha, R., Boakye-Yiadom, A., ... & Asare, R. O. (2020). Preconception Knowledge and Practices Among Women in Fertility Age in The Tamale Teaching Hospital of Ghana. European Journal of Health Sciences, 5(2), 1-15.

Chuang, C. H., Velott, D. L., & Weisman, C. S. (2010). Exploring knowledge and attitudes related to pregnancy and preconception health in women with chronic medical conditions. *Maternal and Child Health journal*, *14*(5), 713-719. https://doi.org/10.1007/s10995-009-0518-6

Dako-Gyeke, P., Aikins, M., Aryeetey, R., Mccough, L., & Adongo, P. B. (2013). The influence of socio-cultural interpretations of pregnancy threats on health-seeking behavior among pregnant women in urban Accra, Ghana. BMC pregnancy and childbirth, 13, 1-12.

Frey, K. A., & Files, J. A. (2006). Preconception healthcare: What women know and believe. *Maternal and Child Health Journal, 10*(1), 73-77.

Gunaratna, N. S., Masanja, H., Mrema, S., Levira, F., Spiegelman, D., Hertzmark, E.,…, & Fawzi, W. (2015). Multivitamin and iron supplementation to prevent periconceptional anemia in rural tanzanian women: A randomized, controlled trial. *PLoS One, 10*(4), e0121552-e0121552. doi:10.1371/journal.pone.0121552.

Harelick, L., Viola, D., & Tahara, D. (2011). Preconception health of low socioeconomic status women: Assessing knowledge and behaviors. *Women's Health Issues, 21*(4), 272-6. doi:10.1016/j.whi.2011.03.006.

Harelick, L., Viola, D., & Tahara, D. (2011). Preconception health of low socioeconomic status women: Assessing knowledge and behaviors. *Women's Health Issues, 21*(4), 272-276.

Johnson, K., Posner, S. F., Biermann, J., Cordero, J. F., Atrash, H. K., Parker, C. S., ... & Curtis, M. G. (2006). Recommendations to improve preconception health and Health Care—United States: report of the CDC/ATSDR preconception care work group and the select panel on preconception care. Morbidity and Mortality Weekly Report: Recommendations and Reports, 55(6), 1-CE.

Kinney, M. V., Kerber, K. J., Black, R. E., Cohen, B., Nkrumah, F., Coovadia, H., . . ., & Lawn, J. E. (2010). Sub-Saharan Africa's mothers, newborns, and children: Where and why do they die? *PLoS medicine, 7*(6), e1000294. https://doi.org/10.1371/journal.pmed.1000294. Lassi, Z. S., Dean, S. V., Mallick, D., & Bhutta, Z. A. (2014). Preconception care: Delivery strategies and packages for care. *Reproductive Health, 11*(Suppl. 3), S7. doi:10.1186/1742-4755-11-S3-S7.

Mitchell, E. W., Levis, D. M., & Prue, C. E. (2012). Preconception health: Awareness, planning, and communication among a sample of US men and women. *Maternal and Child Health Journal*, *16*(1), 31-39. doi:10.1007/s10995-010-0663-y.

Mittal, P., Dandekar, A., & Hessler, D. (2014). Use of a modified reproductive life plan to improve awareness of preconception health in women with chronic disease. *The Permanente Journal, 18*(2), 28.

Ojukwu, O., Patel, D., Stephenson, J., Howden, B., & Shawe, J. (2016). General practitioners' knowledge, attitudes and views of providing preconception care: A qualitative investigation. *Upsala Journal of Medical Sciences, 121*(4), 1-8. doi:10.1080/03009734.2016.1215853.

Seshadri, O. P., Nelson-Piercy, C., & Chappell, L. C. (2012). Prepregnancy care. *BMJ, 344*(3467).

Singh, S., Sedgh, G., & Hussain, R. (2010). Unintended pregnancy: Worldwide levels, trends, and outcomes. *Studies in Family Planning, 41*(4), 241-250.

Southampton Women's Survey, 2006. Available at https://www.mrc.soton.ac.uk/sws/

Stephenson, J., Patel, D., Barret, G., Howden, B., Ojukwu, O., Pandya, P., & Shawe, J. (2014). How do women prepare for pregnancy? Precocneption experiences of women attending antenatal services and views of health professionals. *PLoS One, 9*(7): e103085. doi:10.1371/journal.pone.0103085

UNICEF. (2010). *Levels and Trends in Child Mortality: Report 2010: Estimates Developed by the UN Inter-Agency Group for Child Mortality Estimation.* United Nations Children's Fund.

WHO (2013). *Meeting to develop a global consensus on preconception care to reduce maternal and childhood mortality and morbidity: 6–7 February 2012 meeting report*. Geneva: World Health Organization Headquarters.

Either You Break or Brighten Up: Exploring Dental Professionals' Experiences of Dealing with Emotional Distress during Dental Practice. A Qualitative Description

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Abstract

Purpose: The study purpose was to provide qualitative description of distress, its manifestations and role of resilience as perceived by practicing dentists in the Kingdom of Saudi Arabia (KSA). The goal was to provide fresh insights into the topic of distress and required coping skills in order to inform the development of future stress management programs.

Methodology: This study was designed qualitatively to determine the causes and impacts of stress among practicing dentists in KSA. Purposive sampling of dentists having not less than 5 years of practice and an average of 54 working hours per week (SD= 6) was done based on convenience approach. Twelve semi structured individual interviews with the help of an interview guide, were conducted and audiotaped to collect the data. After analysis of descriptive data, a coding scheme with four categories was generated by continuous adjustments. The categories originated as; stressful situations, impacts of distress, coping strategies and need of future interventions, were then applied to every single interview. This had identified many codes/themes and sub codes/subthemes related to the topic. The codes emerged were also double checked with the supervisor to have an inter-coder agreement. The participants were contacted again to validate the given information in the transcribed interview to increase the credibility of the study.

Findings: Work load, different kind of patients and financial pressure were reported as major cause of distress for dentists during practice. The cognitive reactions to distress came out to be some physical and many emotional disturbances affecting both the professional and family lives of dentists.

Regarding the experiences to cope, they implemented personal strategies to be resilient instead of compromising the quality of care they deliver. Also, they emphasized on the need of following interventions; Continued dental education with training courses to improve resilience amongst dentists and modified dental curriculum for dental students to face positively, the distressful situations in future practical part of their profession.

Unique Contribution to Theory, Practice and Policy: This study provided deep understandings of already developed concepts regarding stress and coping. The study findings proposed that individuals should focus on delivering high quality care by utilizing positive stress coping strategies. They should learn to adopt strategies that are easily accessible and sustainable within the context of a busy dental practice. Interventions to improve skills like motivation, self-determination and decision making should be implemented. Thus the study calls for imperative steps to be taken by stakeholders in dental institutes and at dental practices.

Keywords: *Distress, Emotional Distress Dentists, Quality Oral Care, Stress Coping Mechanisms, Dentist Resilience*

INTRODUCTION

Dentistry is reported as highly stressed profession due to work environment with increased demands of expertise and effectiveness (Hancocks, 2014; Gorter, Eijkman &Hoogstraten, 2000).Handling highly demanding patients, having time constraints and financial pressure makes the job of dentists very sensitive and intense (Ahola & Hakanen, 2007; Alzahem et al., 2011; Bickford, 2005). These factors make them suffer from emotional exhaustion resulting in reduced personal and professional accomplishments (Pohlmann et al., 2005).

Due to work pressure of reaching success in short time and competing strong financial market, dentists face distress at their practice. These circumstances affect negatively on the performance of the dentist with adverse impacts on the quality of care being provided to the patients. This created a need to study in depth, the factors provoking distress and the measures to combat it through enhanced resiliency.

The common perception of stress is an adverse response to any challenging situation which is detrimental to health and psychology (Orzechowska et al., 2013). Emotional distress occurs with an unpleasant feeling in a challenging situation due to inability to cope (Corley et al., 2005). There is natural tendency in an individual to return back to normal when the stress is relieved known as resilience (Smith et al., 2008). It depends upon the coping abilities which can be positive or negative in the state of distress. The distress amongst dentists is found to be started from their education level. Dental education is perceived to be highly demanding which requires proficiencies in both theoretical knowledge and practical competencies (Polychronopoulou & Divaris, 2005; Rajab, 2001).

Statement of the Problem

Apart from various physical and mental impacts, stressful situations also result in loss of efficiency with adverse impacts on the quality of care (Sparks, Faragher & Cooper, 2001). This might be the result of ineffective coping strategies practised by dentists in the state of distress (Lindholm, 2006; Laschinger et al., 2004). This study is, therefore, planned to have fresh insights in to the phenomenon and to notify the development of future stress management programmes through perceptions of practising dentists in KSA.

Many studies have provided the impacts of distress on professionals and highlighted active strategies to cope with the stressful situations (Abdul jabbar, 2008; Jain & Bansal, 2012). Previous studies on the topic lack theoretical

underpinning of interventions required to build resilience amongst dentists in KSA (Al-Sowygh, 2013; Ousehal, Lazrak & Hassani 2011).

Many studies previously tried to assess the strategies used by dentist in the state of stress and (Awa, Plaumann & Walter, 2010; Wiederhold, et al., 2018. But without proper implementation of interventions, the quality of care provided by dentists is on the edge to be compromised (Basson, Nel & Bhat, 2015). The preliminary studies emphasized the need of getting an insight regarding dentists coping strategies and health outcomes in relation to distress.

The purpose of this study was to explore the experiences of practising dentists in dealing with stress with an in depth, holistic approach. This qualitative study is planned to analyze the factors for stress and coping, acting as coordinators or barriers to dentists' clinical practice. It aimed to ascertain the existence of stressors causing physical and emotional disturbances amongst dentists and role of resilience to mitigate the harmful impacts of distress. Also the goal was to deepen the understandings and to identify potential future interventions to promote patient safety with increased quality care (Monrouxe et al., 2015).

Aim and Objectives of the Study

This study was planned to have fresh insights in to the phenomenon and to notify the development of future stress management programmes through perceptions of practising dentists in KSA. The aim of the study was to explore the experiences of practising dentists in KSA to have an in depth understanding of stress, coping and impacts on quality of care with following objectives;

i To examine the conditions or factors relevant to emotional distress affecting quality of care being provided to dental patients.
ii To explore dentists' experiences of various coping strategies during that state.
iii To notify the development of future stress management interventions for dentists in KSA.

LITERATURE REVIEW

Theoretical Framework

Three theoretical foundations were used as a base for this study; keeping in mind the philosophical underpinnings of qualitative research and considering the limitations of a single theoretical approach (Khankeh et al., 2015).The combination of constructs from following list of three theoretical perspectives

in an integrated conceptual framework were used as guide for conducting this study.

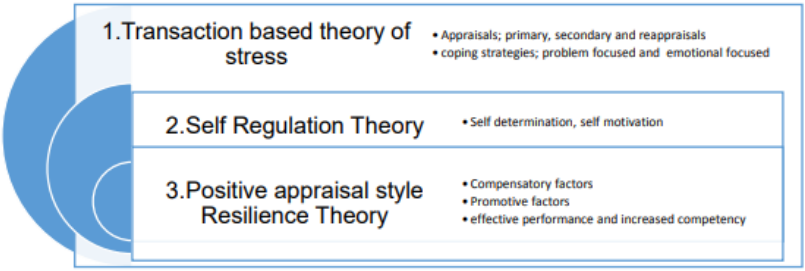

Figure 1: Conceptual Framework Based on Three Theories

This conceptual model incorporates patient care risk paradigm and dentists' coping perspectives when they are emotionally distressed. This is further pillared by *Resilience theory* which states that an individual becomes resilient when he understands that he is the only one who has power to withstand the stressful conditions (Zimmerman, 2013). It is the cognitive system including; perception, expectation, schema formation and reaction, that guides the individual behaviour for self-motivation and self-determination in adverse circumstances (Leventhal & Ian, 2012). A cognitive schema is built based on information about what to expect in a stressful condition and ability to self-regulate one's own behaviour.

Empirical Review

Stress occurs when there is inconsistency between the requirements of the situation and the individual's capabilities (Pouradeli, 2016). Researchers have reported dentistry as a hard and stressful profession (Gorter, Eijkman & Hoogstraten, 2000; Tyssen &Vaglum, 2002). This is reported to be due to highly competitive field requiring dentists to reach the peak of success in short span of time. Also dentistry is perceived to be difficult cognitively so work life imbalances affect mental health of dentists (Seidberg & Sullivan, 2004).

A qualitative study by Humphris and Cooper (1998) found the main cause of stress at work is financial pressure accompanied with high number of patients and their demands. Gorter et al. (1998) further investigated the factors provoking burnout in Dutch dentists. Their study called the attention for the need of career planning to avoid burnout due to lack of career perspective. Other undermining factors which put dentists at greater risk of stress are lack

of support, poor management, time constraints and low working capacity (Kemp & Edwards, 2014).

These studies plus the descriptive study by Moore and Brodsgaard (2001) tried ranking the prevalent factors of stress perceived by dentists starting from financial pressures, work pressures, uncooperative and demanding patients, and unfavourable working conditions. Financial issues, time strain and lack of support are the stress provoking factors faced by dental graduates. Many international studies were also conducted to research over the causes of stress in dental students (AlOmaari, 2005; Morse & Dravo, 2007; Sofola & Jeboda, 2006).

These studies highlighted the demanding nature of dentistry which involves clinical trainings and preclinical studies. Newbury-Birch et al (2002) conducted a longitudinal study to assess stress in same intervals between dental students and medical students. The study concluded that clinical requirements with stress of dental licensing exams contribute to high level of distress among dental students. Although, a plethora of studies to examine impacts of stress on dentists wellbeing are present in literature (Bhugra, Bhui, & Gupta, 2008; Denton, Newton, & Bower, 2008) but as mentioned by Fox (2010) stress affecting clinical decision making skills of dentists is considered to be novel area for research.

Many studies informed the impact of distress in the form of compromised quality care, errors in treatment plans and cynical behaviour (Shanafelt et al., 2010; Tsutsumi et al., 2007). A cross sectional study on dentists by Ahola and Hakanen (2007) gave a significant evident on excessive work load causing burnout leading to psychiatric problems and emotional distress. Family life deteriorates and mental health gets worse with higher level of distress. This was in line with previous evidences in research regarding negative impacts of distress (Denton et al., 2008; Dyrbye et al., 2005). They found job dissatisfaction, physical and mental ill being, poor patient care and low esteem as the adverse effects of distress. Brown et al. (2010) and Hill et al. (2010) surveyed dentists in the UK mentioning anxiety and depression at work to be the reason of emotional ill being.

Literature reveals studies claiming high prevalence of suicide amongst dentists (Galan et al., 2014; Jones, Cotter & Birch, 2016). Suicides results in the state of crisis with loss of abilities to cope various stresses of life like financial collapses or health impairments. Emotional distress in the form of depression was found to be the main provoking factor for suicidal attempts (Domínguez-

García & Fernández-Berrocal (2018). Dentists fall in to this marginalized group of people who are vulnerable to this suicidal state due to socioeconomic stress (Meltzer 2008; Hawton, 2011).

Resilience is the coping ability which results in Dentists' enhanced decision making skills and improved quality care (Daly et al., 2013). High level of self-esteem increases the cognitive response of an individual to deal positively with any unexpected situation. Low level of selfesteem demoralizes the individual making him/her incapable to deal the challenging situations (Balgiu, 2017).

Similarly, results of a postal survey amongst 500 dentists in UK by highlighted high levels of burn out and low work performance (Denton et al., 2008). Chapman et al. (2017) evaluated a CPD package for dentists, which included a workshop for 3 hours to enhance coping skills, build resilience and improve decision making skills. They found reduced level of stress with enhanced wellbeing of dentists at 6th week. Change was sustained only for 6 months which demands further development of interventions.

Need for this Provision

Previously many studies have examined the relation between distress and its impacts on physical and emotional wellbeing of dentists (Bhugra et al., 2008; Denton et al., 2008). However, there was lack of research on stress affecting clinical performance of dentists, lowering the care quality. Newton et al. (2002) stated that stress is constantly inhabited in dental practice because of lack of awareness and less understanding of the phenomenon itself. Plessas et al. (2018) had a systematic review on impacts of stress on dentist clinical performance but the pitfall related to this and other studies found was that they had not reflected real life experiences. Thus a gap was identified as no empirical studies were found exploring the phenomenon by evaluating dentists' clinical performance under stress.

The disastrous effects of distress on the health professional career needs to addressed as it lowers the morale and hampers clinical care to patients (Allen et al., 2013). Rada and Johnson-Leong (2004) emphasized on reviewing emotional distress and its impacts to develop effective and preventive strategies. Pouradeli et al. (2016) highlighted the need to learn the sources of stress and existing coping strategies before any future intervention could be planned to relieve it. Few surveys reported that 68.4% dentists suffer both physically and psychologically from stress in UK, 59.7% in Denmark and 58.9% in Iran (Myers &Myers, 2004; Pouradeli et al., 2016). However, the impacts of distress on quality care is explored by few studies.

Therefore, a need is identified to develop the concepts regarding stress and its impacts on quality of care and to search for effective coping plans for dentists (Luther et al., 2000). Some qualitative studies by Radcliffe and Lester (2003) and Murphy et al. (2009) are conducted on stress and its management amongst medical students but number is scarce when we talk about stress amongst dental practitioners in KSA. Literature provides no evidence of studies with sustainable interventions to control stress amongst dentists in KSA (Gilmoure et al., 2005).

Grant and Kinman (2014) also stressed on having an insight to facets underpinning resilience for developing future stress management interventions. This study was, therefore, planned to stem the gap between increased stress levels and the required skills to cope by the dentists in KSA. Literature shows no empirical studies evaluating impacts of stress on real life dentists' performance in KSA. Most of the studies are performed outside KSA and few in KSA but targeting dental students instead of practicing dentists. Also the studies found were mostly quantitative in nature and to the best of author's knowledge this is first qualitative study being conducted on practicing dentists in Buraydah, KSA.

METHODOLOGY

Ethical Consideration

The researcher sought for the code of conducts from the dental primary care center in Buraydah, KSA to get the official permission for this research. An email with the proposal attached was sent to their official address with a request for letter of authorization to conduct this research. Then the approval was gained from the University's ethical committee. This research was classified as low risk study with no potential harm to the participants at any level. Potential benefits of the study for whole dental community and role of researcher was debriefed to the participants.

Materials and Methods

Study Design

Qualitative design for this study seemed best fit to answer 'whats' and 'hows' of research questions. Qualitative approach provides in depth understandings of complex phenomena and aims at developing concepts by empirically evaluating individual's perceptions (Al-Busaidi, 2008).

Settings and Sampling

Three primary, top rated dental care centers belonging to one owner in Buraydah, KSA, were selected to conduct this study. The participants worked in these dental centers so study place was in their access. This researcher was, therefore, able to explore the research questions within the context where emotional distress has occurred (Flick, Von Kardorff & Steinke, 2004).

Purposeful sampling technique was used to recruit dentists having the potential to provide in depth data about the study questions. Suen, Huang and Lee (2014) indicated that this technique requires the researcher to select potential subjects who can provide rich data based on the study purpose. The researcher continued till the textured data with rich understanding of the phenomena under study was gained. The aim of the study was to conduct 10-15 interviews and researcher managed to get enough data in 12 interviews lasting between 30-40 minutes.

Inclusion criterion for participating in the study was private practicing dentists with working experience of not less than five years with in the same city of KSA. Homogenous sample by focusing on one specialty of health care providers helps increase the credibility of the study (Mankaka, Waeber & Gachoud, 2014).

Participants

Seven male dentists and five female dentists with age range of 35-50 (SD=5.97) participated in this study shown in table 1. They were all foreigners working in KSA, belonging to different nationalities with English not being their mother tongue. All of them were full time employees with an average of 8 hours per day (SD=1) working shifts and varied numbers of patient appointments. All of them were entitled to annual vacations ranging from 21-30 days. Five of them worked as general dental practitioners with a bachelor degree, four were dental specialists with post-graduation and three were consultants in dentistry. None of the volunteers declined to participate and they showed awareness to the constructs “Distress” and “Resilience”.

Table 1: Demographic Characteristics of the Participants

Gender	Males	Females
No of participants	7	5
Ages	38-50 years old	35-40 years old
Duty hours	8-10 hours	8 hours
Experience	10-20 years	7-16 years
Nationality	Non- Saudis (mixed nationalities like Pakistanis, Syrians, Egyptians and Sudanese),	

Data Collection

Semi structured individual interviews were planned for data collection as participants might be reluctant to share their experiences of stress openly. Semi structured Interview questions were designed to unfold meanings to participants' experiences and probing questions were added to clarify responses and to identify reversible factors for improving health care (Wright, Holcombe, & Salmon, 2004). Researcher planned individual interviews for getting rich information from the voice of participants through their perceptions (Hatch, 2002).

To reach out to ambiguities and to remove any pitfalls, researcher conducted pilot interviews with two senior dentists in that social setting. They were asked to evaluate the question by giving any suggestions to improve. Minor adjustments were then made to interview questions. Discussion with supervisor also helped in formulation of interview questions which reduced the researcher biasness. The study took almost 6 months to be completed.

Although the strategy to do data analysis was planned initially, researcher however followed the guidelines by Braun and Clarke (2006) of collecting the data first and then coding it via thematic analysis. Formal invitations were then sent through email to the participants and individual interviews were scheduled in one quiet room available at their work place.

The instructions were given to the manager for no possible disturbances during the interview. DiCicco-Bloom and Crabtree (2006) advised to investigate the research questions in an interview through the help of a guide; therefore, researcher used an interview guide with open ended questions to explore during interviews. The interview was conducted in English as all the participants studied dentistry in English. Grammatical mistakes were adjusted while the interviews were being transcribed verbatim.

Researcher encouraged the participants to talk freely by affirming responses and by acknowledging their points of view. They were recorded in a 'sound app' of smartphone with a backup in PC word processing Programme secured with strong password. Anonymity was guaranteed by replacing their names with pseudonyms which can provide flexibility to manipulate the data. After the actual interview was conducted, participant was told that he or she would be contacted again to validate the given information in the transcribed interview by the researcher. Thomas (2017) notified that participants can help in data triangulation by checking the transcribed verbatim and also the analysed results.

Participants were encouraged to answer honestly so the system of the context can be changed (Schwappach & Boluarte, 2009). They were motivated before the study by having a smart talk about the benefits of the study for their personal and professional lives. Also the researcher tried to provide a relaxed atmosphere and made the participants clear that the interview will be a discussion rather than interrogation.

Data Analysis

For data analysis themes were developed from the meanings participants gave to their lived experiences with emotional distress. After all the interviews were transcribed verbatim, they were thoroughly overviewed for precision. This is done by comparing the transcriptions to hand notes and listening to audio recordings concurrently while reading the transcripts. Researcher shared the transcripts with the participants and only one dentist came with some correction regarding the meaning of resilience and clinical reasoning.

As proposed by Gales et al. (2013) data analysis planned in two stages to categorize the data. Data synthesis was started by selecting statements and writing comments on selected data to generate initial frame work of categories. All the emerged categories were refined into the framework of final themes and subthemes in the second phase. Discussion was done with supervisor to resolve any disagreements and to add rigour and triangulation. Manual or conventional way of creating themes without the help of any software was used by the researcher using inductive and deductive approach (Kondracki, Wellman, Amundson, 2002).

Considering coding as an open process, researcher read individual transcript creating codes, revising, renaming, adjusting and creating sub codes. All the transcripts were overlooked to select any potentially interesting and applicable information. This is done by writing comments on selected data to get an

overview of how many times a response containing the certain information was given. All the similar chunks with common meanings were grouped and identified by the researcher in terms of codes.

Researcher then picked the relevant topics from the gained information and arranged them in to themes and subthemes according to their meanings. Many codes were discarded at this time and the code from the group most relevant to portray the theme, incorporating same responses was used. The coded schemes were then merged into one scheme employing the deductive approach. The coding schemes finalized in this way were grouped in four coding categories; stressful situations, impacts of distress, coping strategies and need of future interventions (Skinner et al., 2003).

Researcher in the end compared the information belonging to same themes and subthemes to ensure the similarity in views for accurate and useful description of the data themes were reviewed to be modified or renamed. Required changes were implemented with the help of discussion with the supervisor. Also the participants were handed over the results to validate the meanings as presumed by the researcher. Ultimately using an inductive approach general statements were derived from individual interviews.

Challenge here was to consider the right account for researcher's reflective writing. For this, researcher used Gibb's reflective model proposed by Kinsella (2001) as supportive tool to constrain creativity. Researcher continuously made critical reflection of his own thoughts and actions in the study context to avoid skewedness or biases. Inter coder agreement between researcher and outside coder (supervisor), field notes and audio recording were used to check the reliability of collected and analysed data (Creswell, 2014; Silverman, 2003). Whereas to ensure validity; triangulation, bracketing, member checking with the participants were taken in to account by the researcher.

FINDINGS

To better illustrate the results, Table 3 is presented with the coding schemes originated after the interviews were transcribed. In this way overall views of the participants were categorized. The coding scheme is presented in terms of coding categories, codes, explanation with example quotes. The four code groups are "stressful situations", "Impacts", "resilience" and "future interventions needed". Some codes were adjusted during the coding process like *colleague/ patient relationship* which could be sub coded under "disturbances" or "environment" and eventually used under "disturbances". The information gained from the quotes helped in developing codes in table 2.

Table 2: Coding Categories

Table 2a: Codes Regarding Stressful Situations

Coding Category #1 Stressful Situations

Codes/Themes	Sub Codes	Explanation	Quotes
Patients	Uneducated	Patients don't understand.	"They don't understand what you mean by; take the medicine, brush your teeth, take care of your teeth."
	Complaining	Patients not getting satisfied.	"Patient always have negative idea about dentist that dentist d love money more, they don't care."
	Demanding	Wants100% result/ wants to be treated as shown in social media.	"To talk about personality of Saudi patients, they are demanding and very problematic."
Environment	Working conditions	Clinic not facilitated.	"Sometimes when you are working in clinics that are unsatisfactory for you like dental chair, the air conditioner."
	Uncooperative managers	They don't care and want good income.	He don't care about you, he don't care about what you face every day."
			"Manager want just money, manager wants patients always happy."
	Unqualified assistants	Assistants need trainings.	"Unqualified assistants making more stress for us, they don't know everything about dentistry."
Work Load	Time pressures	Many appointments in a day.	"Patient must enter, put yourself in special time or narrow time and you must finish your treatment in this time."
	Financial pressures	Have to show good income.	"Now if you are working in private clinic or you have owner of clinic also y you have burden of income."

	Strict rules in KSA	Rules favored towards patients.	M.O.H rules are very strict, even common complications can cause great problem for you. You will then be forbidden staff."
Disturbances	Relation with Colleagues	Uncooperative and competitive.	"So the relation is not nice, always competing for more patients, more income."
	Relation with Patients	Argumentative	"Like some patients have much knowledge about treatment, yeah they argue with you."
	Reception	Calling again and again	"The people in the environment, they are also contributing towards stress, especially the receptionists."

Table 2b: The Impacts of Stress

Coding Category#2 Impacts of Stress

Codes/Themes	Sub Codes	Explanation	Quotes
Physical	Bad posture	Body pains/ neck and back pain.	"We have backache, we have headache and abdominal upset sometimes."
	Lack of productivity	Effects on treatment Can't concentrate much	"If you have stress of your work, you can't perform properly."
			"It affects the concentration of the dentist; high quality of work is not delivered."
	Depression	Feel tired/ irritated and anxious.	maybe we'll get diseases like hypertension, like diabetes, like depression."
Emotional	Lack of patience	Tolerance level decreases.	"I don't have patience to explain a lot, talk in a nice way. I am being firm."
	Bad moods	Affects job and family.	"[…] bad mood we cannot do good job, also affect our family." d
	Job Dissatisfaction	Wants to quit job.	"At the moment, I am thinking about I'm not going to do dentistry anymore."
Lack of Self Care	Eating too much	Starts eating much.	"I will eat a lot of chocolates, that's why getting fat."
	Lack of time	Family gets ignored.	As I told no family time no friends, no social activities, no fun."
	Isolation	Wants to stay alone.	"You want to stay alone f for a long time, you don't like anyone to talk."

Table 2c: Ways for Being Resilient

Coping Category#3 Being Resilient

Codes/Themes	Sub Codes	Explanation	Quotes
Circumstances	Managing work load	Reducing appointments.	"Patient number should be reduced; this is first thing to do."
	Taking rest	Take breaks between appointments.	"So, I try to not work a lot of working hours or you may like daily stops or breaks in between large visits."
Managing Patient	Empathetic listening	Smart talk.	"By being very calm ok, hearing too much."
	Show confidence	Take the decision.	"To accept or not accept, it's my decision, yeah, I work by stress or relax." accept, it's my decision
Short Term Planning	Music	Listening to music/dancing.	"Just dancing, listening to music."
	Long drives	Going for long drive.	"I just drive with my car s staying for 30 minutes one hour just driving, listening to music."
	Eating chocolates	Taking a treat.	Chocolate also, yes chocolate is a big stress reliever."
Support	Friends/family	Talking to some member.	"If you don't have a supportive husband, supportive family then I think you will go to madness really."
	Assistants	Talking to assistants.	"She can talk with me, so she would make me relax."
	Colleagues	Talking to colleague Sharing experiences	"You must learn from the experience of you friends your colleagues."
Long Term Planning	Vacations	Taking long vacations.	"I take every six months v vacations, okay to relax myself."
	Sports	Going for gym/walking.	"I advise dentists to practice some sports even walking."
	Isolation	Isolating you from work place.	"Even though you will not go travelling abroad you can collect your items and complete isolation from everyone."

Table 2d: Need of Future Interventions to Make Dentists More Resilient

Coding Category#4 Future Interventions

Codes/Themes	Sub Codes	Explanation	Quotes
Dental Students	Reformed dental curriculum	Additional chapters	"Psychology should be added in the subject of dentistry which would help."
	Mentorship	Teachers sharing experiences.	"Must be delivered in school that this profession is highly demanding profession."
Dentists	Crash courses /workshops	To train them to be resilient.	"I think training for them is very good, not only in scientific things, even emotional."
	Meetings/ Get together	To share their experiences.	"Many dentists they have more experience yes for sure you can meet another dentist and share experience."
			"One I think you must learn from the experience of our friends, your colleagues."

The first two interview questions; "Do you think working as dental professional has some stress?" and "Have you ever experienced stress?" is answered affirmatively by all the participants. When asked about the conditions or factors relevant to emotional distress the coding categories originated as "patients", "environment", "workload" and "Disturbances".

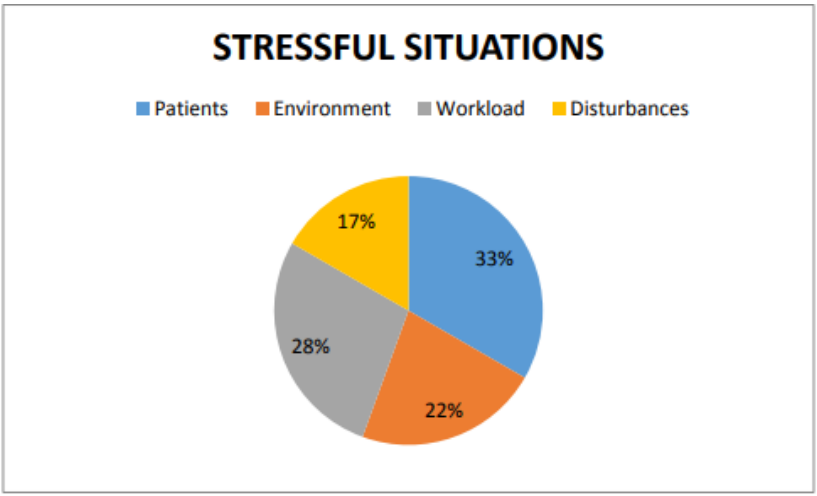

Figure 2: Pie Chart Showing Codes Emerged Under Stressful Situations According to Frequency

According to the pie chart, patients were reported as a source of stress by 33% of sample followed by workload 28%, environment 22% and disturbances 17%. Patients were found to be the greatest source of stress as informed by almost all the participants. Therefore, the first theme generated was named as "Patients". There were three sub codes found under the theme "Patients" as; "*un- educated", "complaining" and "demanding"*. Almost all the participants reflected on this as the first factor causing distress for them.

"They are very stressing when they are not educated, being ignorant in dental treatment, when you are explaining what you're going to do, and you find a patient who doesn't understand". Another participant reflected, "Patient problem Okay, we have different type of patients come in every day for our clinic there is difficult patients and there is the one demanding patient and there is anxious patients."

Three participants pointed out that previous dental history of the patient is a factor making him more demanding. Two of them mentioned about language barrier in the country as the perceived cause of stress from patients. "Okay, they don't understand language is the main problem, either the patient or the management there are few who understand the language but there are many who don't."

The second theme “Environment” resulted in 5 subthemes; “working conditions”, “uncooperative managers”, “unqualified assistants”, “disturbances” and “lack of appreciation”. “Yeah, bad work environment […] I mean, if you are working in a clinic and the clinic, it's not a friendly environment, or doesn't make the dentist feel comfortable inside this clinic.” The participants also mentioned about the “Disturbances” they have due to conflicts with colleagues and patients and interference of reception in the work.

The third code under this category came out to be “Workload” with 3 sub codes; “time pressure”, “financial pressure”, “strict rules in KSA”. Financial pressure is the most frequently used code. Two participants related their experience of workload with time pressure. One participant expressed work pressure in relation to demands by managers as follows;

“You have appointments, and then you will find the manager he's calling and you have to take this patient, I don't have time for him […]. This is very stressing plus disturbing.” Almost all the participants experienced distress due to rules in KSA which are favouring patients more than dentists. Furthermore, all these conditions perceived as a cause for distress are accelerating each other.

Stress Manifestations

Answer to next question “How do dentists perceive stress?” was categorized into “physical” and “emotional” impacts plus “lack of self -care”. “Back and neck pains” described by the participants were coded under “bad posture”. One participant portrayed physical strain from bad posture as; “Physical strain, this mean skeletomuscular pain, some time here from position of dental chair we have backache, we have headache, we have abdominal upset some time.”

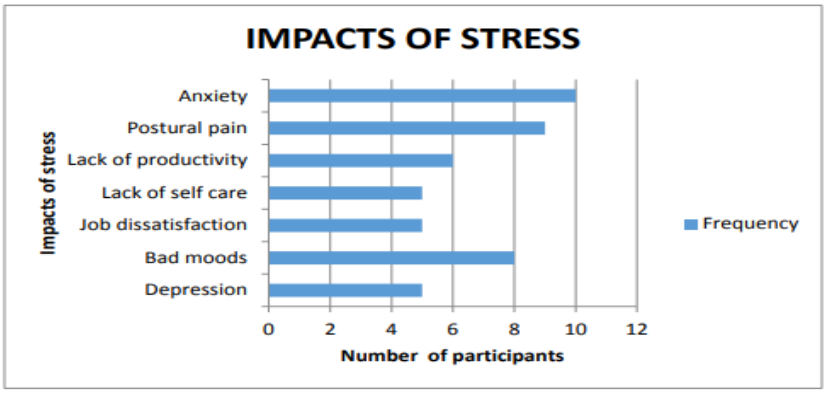

Figure 3: Various Impacts of Stress Reported by the Participants

According to frequency, *anxiety* reported by almost all participants followed by *pain* and *bad moods*. *Lack of productivity* is informed by few though all females talked about *depression* and *lack of self-care*.

In terms of cognitive performance, three participants mentioned about "lack of productivity" and "bad mood" affecting their practice or the next patient, though they always try to be resilient. Females mentioned about being more emotionally distressed causing them "depression" and one of the female participant told about the disease named fibromyalgia she got from continuous emotional distress. *"I went to an immunity doctor. He told me that you're suffering from diseases called fibromyalgia. And the main cause and the most probably, it's because of stress."*

Another cognition is getting fed up of the job and thinking of quitting or having a carrier shift which is coded as "job dissatisfaction." "*Every morning you open your eyes to, is this is a kind of life I want to live? Sometimes you feel yourself I don't like to go to work today or every day. Yeah, I want to stop this profession. I want to make a career shift."* This goes along with change in behaviour where participants, when distressed, start "*eating more"* and "*get isolated"* from others.

They mentioned also of having no *time for self and family* so all this is coded under "Lack of self-care." "*I may go back home and I was very tired to the getting in contact with my family or even go out to dinner with my girlfriends and my BFF*." One male participant mentioned sleep as his stress reliever

"*Okay, okay. I do nothing. I just eat, sleep. Okay, so as I told you, I go to home. I'm like a dead person."*

Being Resilient

The Next Question Was on Sharing Their Experiences of Being Resilient in the State of Distress

"How dentists show resilience in the state of distress?" Participants answered this question by conveying the strategies they use in state of distress. Resilience is the ability to appraise stress positively and it increases the individuals' cognitive decision making skills (Staal et al., 2008). Gender differences were not found in this study for coping stress might be due to limited study sample.

Male Participants were found to be interested in the use of problem focused strategies while females reported availing emotion focused strategies. Problem focused strategies are those kinds of plans used to deal with the stressor itself while emotion focused strategies combats the negative emotional responses when the stressful situation is out of control (Lazarus & Folkman, 1984).

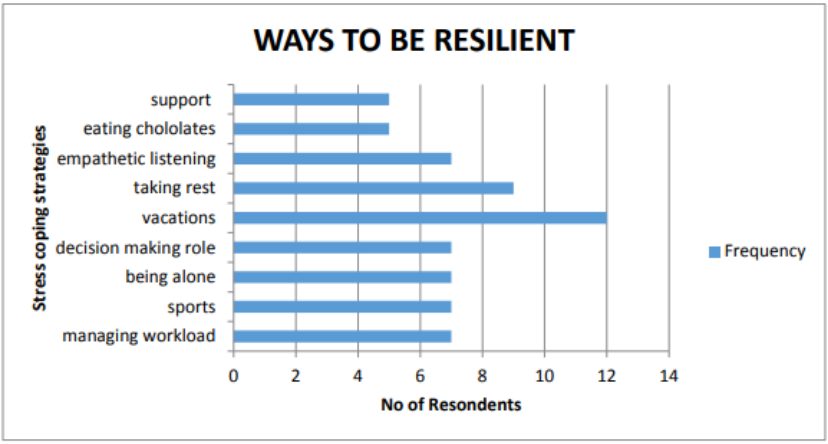

Figure 4: The Participants' Ways to Cope Stress

In this figure *"Vacations"*. were found to be long term agreed coping strategy by all 12 of them followed by "*taking breaks"* between the appointments. "*Managing work load"*, "*sports"*, "*isolation"* and "*decision making role"* was

reported the coping strategies used by seven participants. Few mentioned about taking "*support"* and "*eating chocolates"* as their stress relievers.

The strategy reported by the participants for "*managing workload"* is to reduce the number of patients in a day. *"If you plan to make for some patient long procedures, try to make it short procedure. You inform the patient to come for next visit its better, is good like this."* Female participants emphasized on giving time to patients by listening and having a small pre-treatment talk which can "*manage patient relations"* well. Also they stressed on "*taking rest/breaks"* between appointments to make them relax and ready to welcome new patient with positive energy.

Some of the participant's stress on the importance of talking to family, friend or even an assistant which was coded as "support". All male participants highlighted the importance of "*sports"* to have greater control of the stressful situations. "*Talking to somebody who is close to me talking and go to sport sometimes gym, gym, I like go sports. When I go there I just relax."*

The quotes by females mentioning "*long drives",* "*listening to music* "and "*eating chocolates"* as stress relievers were sub coded under short term resiliency. Female participants claimed to be have more emotional distress as they have to take care of the family too. They depicted how it affects their personal life *"Sometimes when you find yourself having a problem with your patient, okay this comes impact this is unconsciously you will it will have impact on your relation to your children and your husband."* 0ut of 5, 3 females have disclosed that they are taking daily medications such as muscle relaxants and pain killers to be fit for work.

The permanent solution to get away from distress mentioned by all the participants is going for *vacations* and specifically expressed by males is to *be alone. "So, I try to not working a lot of working hours or you make like daily stops or like breaks in between larger visits. This is for the short term and for the long term I need to have a vacation in like every two or three months."* Another participant stated "*There should be no one [...] Okay. I don't want anyone to disturb me. If I want to be relaxed, I need to be alone."*

The findings of the present study regarding positive and negative perceptions of stress amongst dentists can be correlated to *stress mindset theory* by Crum et al. (2017). This theory states that "it is all a mindset how stress results in enhancement or debilitation of performance." Resilience is also enlightened through *broaden and build theory* of positive emotions by Fredrickson (2001). Perceiving stress as a challenging situation will result in enhanced performance

while in abilities to cope with stress shatter the mind of the dentists making them physically and mentally unstable.

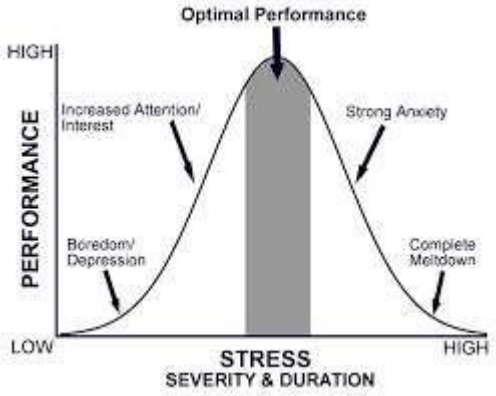

Figure 5: Stress and Performance Curve by Bradberry (2014)

This figure shows that some level of stress is essential to activate the brain and perform some challenging tasks.This stress is harmless unless it becomes persistent and rises above the tolerance level.

Suggestions for Future Interventions

When asked about the need of future interventions to make the dentists resilient, few participants mentioned about preparing them from the start from dental students first. They proposed introducing some topics related to resiliency and stress in dental curriculum. As quoted by a participant "*psychology should be in the in the subject of dentistry which would help a lot so this should be added in the courses even chapters." so* adding chapters on psychology and also *teachers sharing their experiences* will help the students to be prepared for this highly demanding profession. "*They should prepare doctors during school, after school, you are going to enter to the tough life."*

On the other hand, arranging "*workshops/courses"* to train and "*meetings"* to share experiences were sub coded under preparing dentist to be more resilient. *"For these workshops, […] will talk about workshops, they should bring someone qualified, someone who really has experience."*

"Yes, many dentists they have more experience, yes for sure you can meet another dentist and share experience, get dinner with each other […]. It makes stress relief for sure."

Continuous learning from each other experiences and the views of the participants to separate professional life from personal life showed their choice to be resilient instead of getting lost in the state of distress. "*Yeah, this is one I think for you must learn from also the experience of your friends, your colleagues and this is a very important. Make time for your clinic and making time for your family."* This resiliency is helping them not to compromise on their work although they do get physically and emotionally disturbed. They mentioned about emotional disturbances as a reaction to stress also giving them a mood change. *"It's not easy [...] It makes me like it is exploding in the night."*

Lastly, the participants advised others to acknowledge this profession of dentistry as a highly demanding profession from the start when in dental school instead of dreaming it as a money making field. "*The pink dreams you have when you were young that this medical field will be like a gold digging profession. And it is not and you will find this it is not a gold digging profession it's a very hard profession."*

So for the main research question "What are the effects of emotional distress amongst dental professionals in KSA on the quality of care they provide?" almost all the participants, except one, answered that their emotional distress is not compromising their practice or the quality of care they provide. However, few of them commented on situations where anxiety prompted modification of their treatment plans and some mood changes. "*I have the power to control this […] It's just to keep doing what I used to make me relieve the stress."*

These replies might be due to reluctance to disclose their competencies owing to the fact that this will have a bad impact on their reputation (Paulhus, 1984). Another cause could be lack of appreciation to them by their managements. It also might be possible that participants understood the phrase "distress affecting quality of care" in idiosyncratic way. Participants mentioned about strict rules in KSA favouring patients, is also a stress provoking factor and so they should learn how to protect themselves from unseen circumstances. The doctors working in KSA are mostly foreigners and more rights are given to the local patients from the government. If the patient complains in ministry of health, KSA, there could be a penalty for the dentists in terms of paying fine

in the form of money, or a ban on travelling. In worst scenario the patient can sue the dentist and dentist would be blacklisted in Gulf countries and is ultimately deported. "*And to avoid us a risk, to avoid also stress every single day getting to know how to learn, how to protect your self is very important."*

Another cause of professional decline of dentists leading to personal impairments is selfmedication. Dentists feel shame and consider it a stigma to seek support in the state of distress due to fear of leaking confidentiality and legal affairs (Brooks, 2013; Chipchase et al., 2012). Participants reported the same in this study that to alleviate their psychological distress, dentists prefer self-medications instead of taking support. Lastly, participants suggested long term follow up evaluations of the existing interventions) to avoid complexity and to determine if the change through these interventions is sustainable.

Strengths and Limitations of the Study

The study is confirmed by the literature and provided new insights in to dental education. It is also in relevance to the country of study and a strong starting point for further research on this topic in KSA. Participants formulated their answers by their free will and did not ask further questions showing their understanding. Thus the quality of research questions and their relevance to the topic was confirmed. Another strong point of this study is the motivated participants as they were involved in data cross check and were keen to know the results and development of the study. This study will help educators to build resilience in dental students through a problem based curriculum.

The small sample (N=12) shared same health profession and social economic status so the results cannot be generalized to all health professions plus study is limited to a small city of Saudi Arabia. But instead of being limitations, these challenges rather served direction for new research to understand the phenomenon more deeply. Firstly, sound rich data was derived through views of small sample in interviews. Secondly, the findings of this qualitative study are transferable to dentists in the similar context (Curtin & Fossey, 2007).

The study was cross sectional which might have not provided the full picture on stress and coping among practicing dentists. But as Cote andTurgeon (2005) stressed on the importance of critical appraisal in qualitative research, therefore, the researcher has evaluated this type of research by going through literature search for weeks. It is apparent in literature that researchers should be capable of analyzing the data properly and coding it competently (Chiovitti & Piran, 2003; Corbin & Strauss, 2008)). This was a challenge for novice researcher to research using vigorous techniques and skilled procedures for

coding information appropriately. In this regard, researcher sought for guidance from the research supervisor and expert colleagues

Trustworthiness of Data

The rigor can be found in the present study as each step of data analysis could be traced back to audio recordings and field notes to confirm the original study conventions. As told by Corbin and Strauss (2008) triangulation of data fabrication and analysis with multiple viewpoints of participant and co-researchers makes any study credible. Researcher in this study, therefore, contacted participants twice and supervisor many a times for ensuring relevancy of the data.

SUMMARY, CONCLUSIONS AND RECOMMENDATION

Summary

The assumed results from the study are as follows;

i Stressors perceived as hindering dentists to work effectively could be avoided by their self-determination and personalized relaxation plans.
ii Dentistry by choice will enhance the quality of care provided, as the dentists could then treat the patients whole heartedly and competently.
iii Future interventions should focus on improving working conditions of dentists by creating healthy working environment and addressing the known impacts of stress.
iv Dentists' choice to be resilient in the state of distress can be augmented by conducting training in the form of crash courses, workshops, and conferences.
v Changes in dental curriculum by adding few chapters on psychology and ways to enhance resiliency will help to enlighten up dentists in the state of distress.

Conclusion

To eliminate stress completely from the life of dental professionals is something next to impossible. But recognition of the causative factors and improved resilience can bring it to the level where its negative impacts can be avoided. The study puts emphasis on the need for sustained resilience for professional growth and fruitful career of practising dentists in KSA. Long term solution is to identify potential interventions through continuous probing and getting the feedbacks from dentists at every level of stress.

The present study concluded that professionals should be trained to overcome stress by improving their critical thinking and decision making skill. This could be made possible by implementing interventions in the form of continued training courses, changes in dental curricula and shared experiences by senior dentist and faculty.

Overall, the present study is directed towards the stressful nature of dentistry therefore interventions are needed to lessen the work stress of dentists and build resilience for practice. In this regard, de briefing individuals regarding causes and impacts of stress is an utmost and effective intervention in reducing stress level amongst dentists. To execute their role as a competent dental care provider with strong abilities to control stressful situations, future Interventions should be aimed to deal with the complexity of dental practice. They should be flexible to reduce the stress level and its impacts plus they should evaluate the resilience present in a dentist.

Recommendations

Considering the findings of the study, the following interventions to reduce the level of stress amongst dentists are offered;

Support: Patient safety and quality care can be promoted if there is support from the managers and communication amongst health professionals. Findings from this study suggest that dentists' clinical performance is not only impaired by their own experiences but also by the supportive structures of the management. To build a safe, healthy work place and to ensure that dentists have active help line and supportive connections within the profession, managers play a pivotal role.

Change in Dental Curriculum: Integration of chapters to enhance motivation, self-determination and resilience in dental students will prepare them to face challenges positively once in practice. A need for reform exists because of continued demanding nature of dentistry, its stressful environment and requirement of a culture of patient safety and high quality care Training required for nurturing this narrative writing and reflective learning by providing compassionate supervision. There is evidence that some of these competencies are part of the curriculum but they don't focus specifically on building emotional resilience

Work Life Balance: To reduce the effects of stress at work and to build resilience amongst dentists, resources should be made available by the employer. These resources could be in the form of interventions like; personal

counseling, monitoring of dentists' work load and financial issues, developing CPD courses for them and arranging get together so they can share experiences. The clinical manager should be dentally qualified to address and understand the nuances of distressing issues. Professionals need a safe environment under supervision where they can discuss and reflect on their emotional work experiences

Healthy Coping Strategies: As most of the dentists in this study experienced stress, they need to adopt healthy coping strategies by improving dentist patient relationship based on cognitive behavioral therapy by Aaron Beck proposed by Gaudiano (2008). The focus of the theory was to change and replace negative thoughts to reduce stress.

Sharing Experiences: Many a times dentist need to hear experiences from their seniors and colleagues which can help them to cope and manage stress. These times include a transition period from a dental student to dental practitioner where a new dentist can get support by the shared experiences of the mentor. These mentoring programmers can foster many of competencies under pinning resilience such as enhances reflective ability and problem solving skills. Decision making skill is an important aspect of resilience which can be enhanced by improving dentists' ability to cope within challenging states of stress.

Other Recommendations

To the knowledge of researcher this is the first qualitative study exploring distress amongst private practising dentists in Buraydah, KSA. However, to make it applicable to wider dental population it is recommended to enlarge the sample in future by including public practicing dentists as well. Findings of this study can be used to create questionnaire for exploring other dental professionals in the country. Further research should be considered by the educators to gain insight into the critical thinking and clinical decision making skills of dental students and graduates.

Future longitudinal studies are recommended to check for the sustainability of interventions to control emotional distress amongst dentists in KSA. Also, other countries should use similar methods of research to give deep insight on the relationship between emotional distress and quality of dental care. Stress management experiences of dentists may also be varied due to psychological and personal characteristics and this could be another strong area of future research.

Emerging Issues and Controversies

According to Felton, (1998), mental health concerns among healthcare professionals, including dental professionals, have gained significant attention in recent years. The emerging issue could be the increasing recognition of the importance of addressing emotional distress, burnout, and anxiety within the dental profession. Also, The COVID-19 pandemic has had a profound impact on healthcare workers worldwide, including dental professionals. Understanding how the pandemic has affected the emotional well-being of dental professionals and what strategies they have adopted to cope could be an important focus.

Secondly, there might be a controversy surrounding the stigma associated with seeking help for emotional distress in the dental profession (Latalova et al 2014). Exploring whether dental professionals feel comfortable seeking support and the barriers they face in accessing mental health services is crucial. Also, Dental professionals may employ various coping mechanisms to deal with emotional distress. Identifying the most common coping strategies and evaluating their effectiveness can be an important aspect of the study. Also, balancing emotional distress with maintaining positive patient-provider relationships can be challenging. Examining how dental professionals manage these relationships while dealing with their own emotional well-being could be a topic of interest.

Lastly, achieving a healthy work-life balance is essential for mental well-being (Gröpel and & Kuhl, 2009). Exploring the challenges dental professionals face in maintaining this balance and how it impacts their emotional health could be a relevant issue. Also, Assessing the adequacy of training and support systems in place for dental professionals to manage emotional distress is important. Controversies may arise around whether dental education adequately prepares individuals for the emotional challenges of the profession.

It's essential to note that emerging issues and controversies in this field can evolve over time, and the specific focus of research may vary. Researchers conducting a qualitative description study in this area should aim to provide valuable insights into the experiences of dental professionals dealing with emotional distress and contribute to discussions on improving their well-being.

REFERENCES

Abduljabbar, T. A. (2008). Musculoskeletal disorders among dentists in Saudi Arabia. *Pakistan Oral & Dental Journal, 28*(1), 135-144.

Ahola, K., & Hakanen, J. (2007). Job strain, burnout, and depressive symptoms: A prospective study among dentists. *Journal of Affective Disorders, 104*(1-3), 103-110.

Allen, R., Judkins-Cohn, T., deVelasco, R., Forges, E., Lee, R., Clark, L., & Procunier, M. (2013). Moral distress among healthcare professionals at a health system. *JONA's Healthcare Law, Ethics and Regulation*, *15*(3), 111-118.

Al-Omari, W. M. (2005). Perceived sources of stress within a dental educational environment. *The Journal of Contemporary Dental Practice*, *6*(4), 64-74.

Al-Sowygh, Z. H. (2013). Academic distress, perceived stress and coping strategies among dental students in Saudi Arabia. *Saudi Dental Journal*, *25*(3), 97-105.

Alzahem, A. M., Van der Molen, H. T., Alaujan, A. H., Schmidt, H. G., & Zamakhshary, M. H. (2011). Stress amongst dental students: a systematic review. *European Journal of Dental Education*, *15*(1), 8-18.

Awa, W. L., Plaumann, M., & Walter, U. (2010). Burnout prevention: A review of intervention programs. *Patient Education and Counseling*, *78*(2), 184-190.

Balgiu, B. (2017). Self-esteem, personality and resilience. Study of a students' emerging adults group. *Journal of Educational Science and Psychology, VII* (LXIX), 93-99.

Basson, R. A. (2013). Management and prevention of burnout in the dental practitioner. *Dentistry Journal*, *3*(168), 2161-1122.

Bhugra, D., Bhui, K.S., and Gupta, K.R. (2008). Burnout and stress among doctors and dentists in North India. *International Journal of Culture and Mental Health, 1*(1), 24-29.

Bickford, M. (2005). Stress in the Workplace: A General Overview of the Causes, the Effects, and the Solutions. *Canadian Mental Health Association Newfoundland and Labrador Division*, *8*(1), 1-3.

Bradberry, T. (2014). How successful people stay calm. *Forbes*. Retrieved January 20, 2020, from https://www.forbes.com/sites/travisbradberry/2014/02/06/how-successful-peoplestay-calm/

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Brooks, S.K., Gerada, C., & Chalder, T. (2013). Doctors and dentists with mental ill health and addictions: Outcomes of treatment from the Practitioner Health Programme. *Journal of Mental Health*, 22 (3), pp. 237-245.

Brown, J., Burke, F. J., Macdonald, E. B., Gilmour, H., Hill, K. B., Morris, A. J., . . . Murray, K. (2010). Dental practitioners and ill health retirement: causes, outcomes and reemployment. *Br Dent J*, *209*(5), 813.

Chapman, H., Chipchase, S. & Bretherton, R. (2017). The evaluation of a continuing professional development package for primary care dentists designed to reduce stress, build resilience and improve clinical decision-making. *Br Dent J*, 223**,** 261–271 https://doi.org/10.1038/sj.bdj.2017.712

Chiovitti, R. F., & Piran, N. (2003). Rigour and grounded theory research. *Journal of Advanced Nursing*, *44*(4), 427-435.

Chipchase, A., Cordrey, D., Floyd, D., Grubbs, L., Miller, S., & Tyre, B. (2012). Stress: perceptions, manifestations, and coping mechanisms of student registered nurse anesthetists. *American Association of Nurse Anesthetists Journal*, *80*(4), S49-55.

Corbin, J., & Strauss, A. L. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd ed.). Thousand Oaks, CA: SAGE Publications

Corley, M. C., Minick, P., Elswick, R. K., & Jacobs, M. (2005). Nurse moral distress and ethical work environment. *Nursing Ethics*, *12*(4), 381-390.

Cote, L., & Turgeon, J. (2005). Appraising qualitative research articles in medicine and medical education. *Medical Teacher*, *27*(1), 71-75.

Creswell, J. W. (2014). The selection of a research approach. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th ed., pp. 3-24). Thousand Oaks, CA: Sage.

Curtin, M., & Fossey, E. (2007). Appraising the trustworthiness of qualitative studies: Guidelines for occupational therapists. *Australian Occupational Therapy Journal, 54*(2), 88-94.

Daly, B., Batchelor, P., Treasure, E., & Watt, R. (2013). *Essential dental public health* (2nd ed.). Oxford, England, UK: Oxford University Press.

Denton, D.A., Newton, J.T., and Bower, E.J. (2008). Occupational burnout and work engagement: A national survey of dentists in the United Kingdom. *Br Dent J 205*(13), 382-383.

DiCicco-Bloom, B., & Crabtree, B. F. (2006). The qualitative research interview. *Medical Education*, *40*(4), 314-321.

Domínguez-García, E., & Fernández-Berrocal, P. (2018). The association between emotional intelligence and suicidal behavior: A systematic review. *Frontiers in Psychology*, *9*, 2380. doi:10.3389/fpsyg.2018.02380

Dyrbye, L. N., Thomas, M. R., & Shanafelt, T. D. (2005,). Medical student distress: causes, consequences, and proposed solutions. In *Mayo Clinic Proceedings*, 80(12), 1613-1622.

Felton, J. S. (1998). Burnout as a clinical entity—its importance in health care workers. Occupational medicine, 48(4), 237-250.

Flick, U., Von Kardoff, E., & Steinke, I. (2004). What Is Qualitative Research? An Introduction to the Field. In: U. Flick, E. Von Kardoff, & I. Steinke (Eds.), a Companion to Qualitative Research (pp. 3-12). London: Sage.

Fox, C. (2010): Evidence summary: Does dentists' fear have an adverse effect on clinical decision-making? *Br Dent J, 209*,181-182.

Galan, F., Rios-Santos, J. V., Polo, J., Rios-Carrasco, B., & Bullon, P. (2014). Burnout, depression and suicidal ideation in dental students. *Med Oral Patol Oral Cir Bucal, 19*(3), 19281.

Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology*, *13*(1), 117.

Gaudiano B. A. (2008). Cognitive-behavioural therapies: achievements and challenges. *Evidence-based mental health*, *11*(1), 5–7. https://doi.org/10.1136/ebmh.11.1.5

Gilmour, J., Stewardson, D. A., Shugars, D. A., & Burke, F. J. T. (2005). An assessment of career satisfaction among a group of general dental practitioners in Staffordshire. *Br Dent J*, *198*(11), 701.

Gorter, R. C., Albrecht, G., Hoogstraten, J., & Eijkman, M. A. (1998). Work place characteristics, work stress and burnout among Dutch dentists. *European Journal of Oral Sciences*, *106*(6), 999-1005.

Gorter, R. C., Eijkman, M. A., & Hoogstraten, J. (2000). Burnout and health among Dutch dentists. *European Journal of Oral Sciences*, *108*(4), 261-267.

Grant, L., & Kinman, G. (2014). Emotional Resilience in the Helping Professions and how it can be enhanced. *Health and Social Care Education*, *3*(1), 23-34. doi: 10.11120/hsce.2014.00040

Gröpel, P., & Kuhl, J. (2009). Work–life balance and subjective well-being: The mediating role of need fulfilment. British Journal of Psychology, 100(2), 365-375.

Hancocks, S. (2014). Defensive dentistry. *British Dental Journal, 217* (7), 327. doi: 10.1038/sj.bdj.2014.863.

Hatch, J. A. (2002). *Doing Qualitative Research in Education Settings*. Retrieved from http://site.ebrary.com/id/10587283

Hawton, K., Agerbo, E., Simkin, S., Platt, B., & Mellanby, R.J. (2011). Risk of suicide in medical and related occupational groups: A national study based on Danish case population-based registers. *Journal of Affective Disorders*, *134*(1-3), *320-6.*

Hill, K. B., Burke, F. J. T., Brown, J., Macdonald, E. B., Morris, A. J., White, D. A., & Murray, K. (2010). Dental practitioners and ill health retirement: A qualitative investigation into the causes and effects. *Br Dent J*, *209*(5), E8. https://doi.org/10.1038/sj.bdj.2010.814

Humphris, G. M., & Cooper, C. L. (1998). New stressors for GDPs in the past ten years: a qualitative study. *Br Dent J*, *185*(8), 404.

Jain, A., & Bansal, R. (2012). Stress among medical and dental students: a global issue. *IOSR Journal of Dental and Medical Sciences*, *1*(5), 5-7.

Kemp, M., & Edwards, H. (2014). "Stressing out: Sources of Work-related Stress among Salaried Primary Care Dentists in the UK". *Dentistry*, 62-63.

Khankeh, H., Ranjbar, M., Khorasani-Zavareh, D., Zargham-Boroujeni, A., & Johansson, E. (2015). Challenges in conducting qualitative research in health: A conceptual paper. *Iranian Journal of Nursing and Midwifery Research*, *20*(6), 635.

Kinsella, E. A. (2001). Reflections on reflective practice. *Canadian Journal of Occupational Therapy*, *68*(3), 195-198.

Kondracki, N.L., Wellman, N.S. & Amundson, D.R. (2002). Content analysis: Review of methods and their applications in nutrition education. *Journal of Nutritional Educational Behaviour*, 34(4), 224-240. doi: 10.1016/S1499-4046(06)60097-3

Laschinger, H. K., Almost, J., Purdy, N., & Kim, J. (2004). Predictors of nurse managers' health in Canadian restructured healthcare settings. *Nursing Leadership*,*17*(4), 88-105.

Latalova, K., Kamaradova, D., & Prasko, J. (2014). Perspectives on perceived stigma and self-stigma in adult male patients with depression. Neuropsychiatric disease and treatment, 1399-1405.

Leventhal, H. O. R., & IAN, B. (Eds.). (2012). The common-sense model of self-regulation of health and illness. In: *The Self-regulation of Health and Illness Behaviour* (1st ed., pp. 5679). New York: Routledge.

Lindholm, M. (2006). Working conditions, psychosocial resources and work stress in nurses and physicians in chief managers' positions. *Journal of Nursing Management*, *14*(4), 300309.

Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development*, *71*(3), 543-562.

Mankaka, C. O., Waeber, G., & Gachoud, D. (2014). Female residents experiencing medical errors in general internal medicine: a qualitative study. *BMC Medical Education*, *14*(1), 140. doi: 10.1186/1472-6920-14-140

Meltzer, H., Griffiths, C., Brock, A., Rooney, C., & Jenkins, R. (2008). Patterns of suicide by occupation in England and Wales: 2001-2005. *British Journal of Psychiatry, 193*(1), *73-6.*

Monrouxe, L. V., Rees, C. E., Dennis, I., & Wells, S. E. (2015). Professionalism dilemmas, moral distress and the healthcare student: Insights from two online UK-wide questionnaire studies. *BMJ Open, 5*(5), e007518. doi: 10.1136/bmjopen-2014-007518.

Moore, R., & Brodsgaard, I. (2001). Dentists' perceived stress and its relation to perceptions about anxious patients. *Community Dentistry and Oral Epidemiology*, *29*(1), 73-80.

Morse, Z., & Dravo, U. (2007). Stress levels of dental students at the Fiji School of Medicine. *European Journal of Dental Education*, *11*(2), 99-103.

Murphy, R. J., Gray, S. A., Sterling, G., Reeves, K., & DuCette, J. (2009). A comparative study of professional student stress. *Journal of Dental Education*, *73*(3), 328-337.

Myers, H. L., & Myers, L. B. (2004). 'It's difficult being a dentist': stress and health in the general dental practitioner. *Br Dent J*, *197*(2), 89-93.

Newbury-Birch, D., Lowry, R. J., & Kamali, F. (2002). The changing patterns of drinking, illicit drug use, stress, anxiety and depression in dental students in a UK dental school: a longitudinal study. *Br Dent J*, *192*(11), 646.

Newton, J. T., Mistry, K., Patel, A., Patel, P., Perkins, M., Saeed, K., & Smith, C. (2002). Stress in dental specialists: a comparison of six clinical dental specialties. *Primary Dental Care*, *9*(3), 100-104.

Orzechowska, A., Zajączkowska, M., Talarowska, M., & Gałecki, P. (2013). Depression and ways of coping with stress: A preliminary study. *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research*, *19*, 1050.

Ousehal, L., Lazrak, L., & Hassani, K. (2011). Evaluation of stress among 100 Moroccan orthodontists. *Open Journal of Stomatology*, *1*(01), 1.

Paulhus, D. L. (1984). Two-component models of socially desirable responding. *Journal of Personality and Social Psychology*, *46*(3), 598.

Plessas, A., Delgado, M. B., Nasser, M., Hanoch, Y., & Moles, D. R. (2018). Impact of stress on dentists' clinical performance. A systematic review. *Community Dent Health*, *35*(1), 9-15.

Pohlmann, K., Jonas, I., Ruf, S., & Harzer, W. (2005). Stress, burnout and health in the clinical period of dental education. *European Journal of Dental Education*, *9*(2), 78-84.

Polychronopoulou, A., & Divaris, K. (2005). Perceived sources of stress among Greek dental students. *Journal of Dental Education*, *69*(6), 687-692.

Pouradeli, S., Shahravan, A., Eskandarizdeh, A., Rafie, F., & Hashemipour, M. A. (2016). Occupational stress and coping behaviours among dentists in Kerman, Iran. *Sultan Qaboos University Medical Journal*, *16*(3), e341.

Radcliffe, C., & Lester, H. (2003). Perceived stress during undergraduate medical training: a qualitative study. *Medical Education*, *37*(1), 32-38.

Rajab, L. D. (2001). Perceived sources of stress among dental students at the University of Jordan. *Journal of Dental Education*, *65*(3), 232-241.

Schwappach, D.L., & Boluarte, T.A. (2009). The emotional impact of medical errorinvolvement on physicians: A call for leadership and organizational accountability. *Swiss Medical Weekly, 139*(1-2), 9-15.

Seidberg, B. H., & Sullivan, T. H. (2004). Dentists' use, misuse, abuse or dependence on moodaltering substances. *New York State Dent Journal*, *70*(4), 30-33.

Shanafelt, T. D., Bradley, K. A., Wipf, J. E., & Back, A. L. (2002). Burnout and self-reported patient care in an internal medicine residency program. *Annals of Internal Medicine*, *136*(5), 358-367.

Silverman, D. (2013). *Doing Qualitative Research: A Practical Handbook* (4th ed.). London: SAGE publications limited.

Skinner, E. A., Edge, K., Altman, J., & Sherwood, H. (2003). Searching for the structure of coping: a review and critique of category systems for classifying ways of coping. *Psychological Bulletin*, *129*(2), 216.

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *International Journal of Behavioral Medicine*, *15*(3), 194-200.

Sofola, O. O., & Jeboda, S. O. (2006). Perceived sources of stress in Nigerian dental students. *European Journal of Dental Education*, *10*(1), 20-23.

Sparks, K., Faragher, B., & Cooper, C. L. (2001). Well-being and occupational health in the 21st century workplace. *Journal of Occupational and Organizational Psychology*, *74*(4), 489-509.

Suen, L. J., Huang, H. M., & Lee, H. H. (2014). A comparison of convenience sampling and purposive sampling. *Hu Li Za Zhi*, *61*(3), 105-111.

Thomas, D. R. (2017). Feedback from research participants: are member checks useful in qualitative research? *Qualitative Research in Psychology*, *14*(1), 23-41.

Tsutsumi, A., Umehara, K., Ono, H., & Kawakami, N. (2007). Types of psychosocial job demands and adverse events due to dental mismanagement: A cross sectional study. *BMC Oral Health*, *7*(1), 3.

Tyssen, R. & Vaglum, P. (2002). Mental health problems among young doctors: an updated review of prospective studies. *Harvard Review of Psychiatry, 10,* 154-65.

Wiederhold, B. K., Cipresso, P., Pizzioli, D., Wiederhold, M., & Riva, G. (2018). Intervention for physician burnout: A systematic review. *Open Medicine*, *13*(1), 253-263.

Wright, E. B., Holcombe, C., & Salmon, P. (2004). Doctors' communication of trust, care, and respect in breast cancer: Qualitative study. *BMJ*, *328*(7444), 864. doi:10.1136/bmj.38046.771308.7C

Zimmerman M. A. (2013). Resiliency theory: A strengths-based approach to research and practice for adolescent health. *Health Education & Behavior*, *40*(4), 381–383. doi: 10.1177/1090198113493782

Use of Proton Pump Inhibitors in Patients with COVID-19 Infection: Are We doing More Harm than Good?

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Abstract

Purpose: The purpose of this paper was to highlight the use of proton pump inhibitors (PPIs) in the supportive treatment of COVID-19 infection and the potential effects associated with their use.

Methodology: This was a theoretical paper.

Findings: COVID-19 pandemic has had a profound negative impact worldwide on the economic and healthcare machinery. PPIs are important drugs used as supportive therapy for various medical conditions like heart-burn and acid peptic disease. There is an on-going deliberation regarding the probable useful versus deleterious effects of PPI use in patients with COVID-19 infection. Some authorities believe in their usefulness as anti-oxidant and anti-inflammatory agents, while others prove with evidence the potential harm caused by their use in terms of increased vulnerability to infections.

Unique Contribution to Theory, Practice and Policy: Given their possible side-effects, prudent usage of PPI therapy is warranted in patients with active COVID-19 infection.

Keywords: *Pandemic, COVID-19, SARS-CoV-2, Proton Pump Inhibitors*

INTRODUCTION

Coronavirus (COVID-19) infection, (also known as SARS-CoV-2), is predominantly a disease of the respiratory tract, ranging from asymptomatic disease to very severe and life-threatening pneumonia with septic shock leading to secondary multi-organ failure. The virus causing this illness primarily spreads through direct contact or respiratory droplets, although some experts believe it can also be transmitted as an airborne infection. Ever since the World Health Organization (WHO) declared coronavirus (COVID-19) infection as a public health emergency in late January 2020, the pandemic has had devastating effects on global economy and healthcare system. Millions of people across the world have been infected, and despite the recovery rate being satisfactory, thousands have already succumbed to the illness.

In the absence of a definitive anti-viral therapy, mass vaccination may be the only way to prevent the spread of disease. However, the quest for a safe and effective vaccine for COVID-19 infection is still continuing, and authorities are skeptical regarding the availability of one by the end of 2020 [(1)]. So far, standard precautions and social distancing seem to be the only effective measures to inhibit infection transmissibility. This short article provides a crisp overview, based on available data, regarding the potential risks and benefits of using drugs like proton pump inhibitors (PPIs) in patients with COVID-19 infection.

PPIs are the undoubtedly one of the commonest class of drugs which, over the past few years, have been prescribed by physician community across the globe for the management of conditions related to hyper-acidity, namely gastro-esophageal reflux disease (GERD) and peptic ulcer disease [(2)]. However, there is enough evidence to suggest that these medications are being over-prescribed by healthcare practitioners, without keeping specific indications in mind [(3)]. Additionally, it has been hypothesized that hypochlorhydria produced by long-term PPI therapy weakens the immune system of the human body, especially as the gastric juice is considered to be the first line of defense against major pathogens [(4)]. For this reason, there have been growing apprehensions over the grave side effects of PPI therapy, which include increased risk of various infections like pneumonia and clostridium difficile colitis, dementia, chronic renal failure and fractures secondary to osteoporosis, which can even lead to increased morbidity and mortality [(5)].

SARS-CoV-2 virus, besides infecting the respiratory system, can also involve the gastrointestinal (GI) tract [(6)]. Although murine models clearly suggested

that infectivity of Middle East respiratory syndrome coronavirus (MERS-CoV) was reduced in the normal pH of stomach, similar results have so far not been extrapolated for the similar SARS-CoV-2 virus [7]. Having said that, it can well be assumed that increasing the stomach pH by using PPIs can also theoretically intensify the virulence of COVID-19 infection. Also, there is a possibility of the virus spreading from the GI tract to other systems of the body, especially the respiratory system [8]. The use of PPI can also make an individual susceptible to bacterial infections, and investigators have shown that concomitant bacterial infection is clearly associated with increased mortality [9]. Contrary to the above theory, many authorities believe that PPI co-therapy in patients with COVID-19 disease may have therapeutic benefits, as PPIs can reduce cellular oxidative stress and in turn prevent inflammation and fibrosis [10]. Hence, there is an on-going debate as to whether or not PPIs should be administered in patients with COVID-19.

The most robust evidence of the potentially detrimental effects of PPI use in patients with COVID19 infections comes from a large Korean cohort of 1,32,316 subjects, out of which 4,785 tested positive for SARS-CoV-2 infection [11]. In this study, 20,405 individuals were either actively taking PPI therapy or had taken therapy in the past. Adverse outcome measures included intensive care unit (ICU) admission, requirement of mechanical ventilation or death. The study revealed that although patients receiving PPI therapy may not be at increased risk of acquiring SARS-CoV-2 infection, they do have a more severe clinical course as compared to those who are not on PPIs (even when these drugs were used in the short-term). These results, the authors hypothesized, could be due to increased risk of bacterial co-infections in patients continuously using PPIs, as well as increased propensity of developing the cytokine storm. Therefore, the investigators recommended judicious use of these drugs by physicians especially when dealing with COVID-19 positive patients. Similarly, another retrospective study, despite its limitations, showed that PPIs significantly increase the development of adult respiratory distress syndrome (ARDS) in hospitalized patients with COVID-19 disease [12].

One must be mindful of the fact, however, that there are certain circumstances where use of PPI therapy becomes inevitable. Patients with moderate to severe COVID-19 infection may be prone to develop thromboembolic events [13]. These complications can occur even while patients are on prophylactic anti-coagulation. To counter this, hospitals managing these critical patients have developed protocols which include therapeutic anti-coagulation therapy. As GI bleeding is a frequent problem with anti-coagulants, many patients will require

therapeutic endoscopic procedures for control of bleeding. In this regard, along with other factors, the role of intravenous (and subsequently oral) treatment with a PPI cannot be undermined [14]. Furthermore, it is important to identify patients who are at a higher risk of GI bleeding, and commence PPI therapy early in the course of the disease.

Can we avoid using PPIs in COVID-19 patients with low risk for GI bleeding, and use alternatives like histamine-2 receptor antagonists (H2RAs) instead? Interestingly, there is emerging early data on the potential benefit of famotidine (H2RA) in hospitalized patients of COVID-19 in terms of favorable clinical outcome, and maybe recovery [15]. The evidence is nevertheless not convincing so far, and more data is needed in the form of randomized trials to prove this association, as H2RAs also suppress gastric acidity, albeit not as potently as PPIs [16, 17].

CONCLUSION AND RECOMMENDATIONS

Conclusion

PPIs are very valuable, economical and readily available drugs for managing common GI disorders. The jury is still out on the possible role of this group of medications and how it can affect the severity of COVID-19 disease. Administering PPI in patients with GI bleeding or those at high bleeding risk may be necessary, however in non-bleeding scenarios clinicians should be cognizant of the possible side-effects and negative implications of PPI therapy before prescribing them to such patients.

Recommendations

i In patients with SARS-CoV-2 infection, a detailed drug history, including use of PPI should be inquired by the treating physicians and all unnecessary medications should be stopped.

ii Safer options like H2RAs should be tried in patients without GI bleeding.

iii Even if a definitive indication has been established in such patients, PPI should be commenced if the potential benefit outweighs the risk, ideally with the lowest possible dose and for a pre-defined time period.

Emerging Issues and Controversies

According to Beigel et al (2020), COVID-19 was initially primarily associated with respiratory symptoms. Still, it soon became clear that the virus can also affect the gastrointestinal (GI) tract, leading to symptoms such as nausea, diarrhea, and abdominal pain. PPIs are commonly prescribed to treat GI conditions like acid reflux and gastritis, so their use in COVID-19 patients with GI symptoms was explored. Also, PPIs reduce stomach acid production, which can potentially affect the body's ability to fight infections, as stomach acid plays a role in killing ingested pathogens. Some experts raised concerns that the use of PPIs in COVID-19 patients might impair their immune response, making it more difficult for them to clear the virus.

Secondly, Reduced stomach acid can increase the risk of bacterial infections in the GI tract, respiratory tract, and elsewhere in the body (Hunt et al 2015). In COVID-19 patients who are already at risk for secondary bacterial infections, the use of PPIs could potentially exacerbate this risk. Also, COVID-19 patients are often prescribed multiple medications, and PPIs can interact with other drugs. There were concerns about potential drug interactions and whether they could affect the efficacy of treatments for COVID-19.

Finally, Research on the use of PPIs in COVID-19 patients was ongoing, and early studies provided mixed finding (Almario et al 2020). Some studies suggested potential benefits in reducing GI symptoms, while others raised concerns about negative outcomes. Also, the use of PPIs in COVID-19 patients was not standardized in clinical guidelines, leading to variability in practice among healthcare providers.

It's essential to recognize that the understanding of COVID-19 and its treatments evolved rapidly, and new evidence might have emerged since my last update. Therefore, I recommend consulting the most recent medical literature, guidelines, and expert opinions for the latest information on this topic. Healthcare decisions should always be made based on the most up-to-date evidence and in consultation with healthcare professionals.

REFERENCES

Almario, C. V., Chey, W. D., & Spiegel, B. M. (2020). Increased risk of COVID-19 among users of proton pump inhibitors. The American journal of gastroenterology.

Beigel, J. H., Tomashek, K. M., Dodd, L. E., Mehta, A. K., Zingman, B. S., Kalil, A. C., ... & Lane, H. C. (2020). Remdesivir for the treatment of Covid-19. New England Journal of Medicine, 383(19), 1813-1826.

Cheung, K. S., Hung, I. F., & Leung, W. K. (2020). Association between famotidine use and COVID-19 severity in Hong Kong: a territory-wide study. *Gastroenterology*, S00165085(20)34940-4. Advance online publication.

Cui, S., Chen, S., Li, X., Liu, S., & Wang, F. (2020). Prevalence of venous thromboembolism in patients with severe novel coronavirus pneumonia. *Journal of thrombosis and haemostasis : JTH*, *18*(6), 1421–1424.

Freedberg, D. E., Conigliaro, J., Wang, T. C., Tracey, K. J., Callahan, M. V., Abrams, J. A., & Famotidine Research Group (2020). Famotidine Use Is Associated with Improved Clinical Outcomes in Hospitalized COVID-19 Patients: A Propensity Score Matched Retrospective Cohort Study. *Gastroenterology*, *159*(3), 1129–1131.e3.

Goncalves Mendes Neto, A., Lo, K. B., Wattoo, A., Salacup, G., Pelayo, J., DeJoy, R., 3rd, Bhargav, R., Gul, F., Peterson, E., Albano, J., Patarroyo-Aponte, G., Rangaswami, J., & Azmaiparashvili, Z. (2020). Bacterial infections and patterns of antibiotic use in patients with COVID-19. *Journal of medical virology*, 10.1002/jmv.26441. Advance online publication.

Hunt, R. H., Camilleri, M., Crowe, S. E., El-Omar, E. M., Fox, J. G., Kuipers, E. J., ... & Tack, J. (2015). The stomach in health and disease. Gut, 64(10), 1650-1668.

Kazberuk, M., Brzósko, S., Hryszko, T., & Naumnik, B. (2016). Overuse of proton pump inhibitors and its consequences. *Postepy higieny i medycyny doswiadczalnej (Online)*, *70*(0), 1112–1116.

Lee, S. W., Ha, E. K., Yeniova, A. Ö., Moon, S. Y., Kim, S. Y., Koh, H. Y., Yang, J. M., Jeong, S. J., Moon, S. J., Cho, J. Y., Yoo, I. K., & Yon, D. K. (2020). Severe clinical outcomes of COVID-19 associated with proton pump inhibitors: a nationwide cohort study with propensity score matching. Gut, gutjnl-2020-322248. Advance online publication.

Luxenburger, H., Sturm, L., Biever, P., Rieg, S., Duerschmied, D., Schultheiss, M., Neumann-Haefelin, C., Thimme, R., & Bettinger, D. (2020). Treatment with proton pump inhibitors increases the risk of secondary infections and ARDS in hospitalized patients with COVID-19: coincidence or underestimated risk factor. *Journal of internal medicine*, 10.1111/joim.13121. Advance online publication.

Metz D. C. (2000). Potential uses of intravenous proton pump inhibitors to control gastric acid secretion. *Digestion*, *62*(2-3), 73–81.

Patel, P., & Sengupta, N. (2020). PPIs and Beyond: A Framework for Managing Anticoagulation-Related Gastrointestinal Bleeding in the Era of COVID-19. *Digestive diseases and sciences*, *65*(8), 2181–2186.

Price E. (2020). Could the severity of COVID-19 be increased by low gastric acidity. *Critical care (London, England)*, *24*(1), 456.

Taştemur, Ş., & Ataseven, H. (2020). Is it possible to use Proton Pump Inhibitors in COVID-19 treatment and prophylaxis? Medical hypotheses, 143, 110018.

Trottein, F., & Sokol, H. (2020). Potential Causes and Consequences of Gastrointestinal Disorders during a SARS-CoV-2 Infection. *Cell reports*, *32*(3), 107915.

Vaezi, M. F., Yang, Y. X., & Howden, C. W. (2017). Complications of Proton Pump Inhibitor Therapy. *Gastroenterology*, *153*(1), 35–48.

Xiao, F., Tang, M., Zheng, X., Liu, Y., Li, X., & Shan, H. (2020). Evidence for Gastrointestinal Infection of SARS-CoV-2. *Gastroenterology*, *158*(6), 1831–1833.e3.

Xie, Y., Bowe, B., Yan, Y., Xian, H., Li, T., & Al-Aly, Z. (2019). Estimates of all cause mortality and cause specific mortality associated with proton pump inhibitors among US veterans: cohort study. *BMJ (Clinical research ed.)*, *365*, l1580.

Zhou, J., Li, C., Zhao, G., Chu, H., Wang, D., Yan, H. H., Poon, V. K., Wen, L., Wong, B. H., Zhao, X., Chiu, M. C., Yang, D., Wang, Y., Au-Yeung, R., Chan, I. H., Sun, S., Chan, J. F., To, K. K., Memish, Z. A., Corman, V. M., … Yuen, K. Y. (2017). Human intestinal tract serves as an alternative infection route for Middle East respiratory syndrome coronavirus. *Science advances*, *3*(11), eaao4966.

Zhu, F. C., Li, Y. H., Guan, X. H., Hou, L. H., Wang, W. J., Li, J. X., Wu, S. P., Wang, B. S., Wang, Z., Wang, L., Jia, S. Y., Jiang, H. D., Wang, L., Jiang, T., Hu, Y., Gou, J. B., Xu, S. B., Xu, J. J., Wang, X. W., Wang, W., … Chen, W. (2020). Safety, tolerability, and immunogenicity of a recombinant adenovirus type-5 vectored COVID-19 vaccine: a dose-escalation, open-label, non-randomised, first-in-human trial. *Lancet (London, England)*, *395*(10240), 1845–1854.

Effects of Structured Manual Hyperinflation for Improving Respiratory Parameters in Post-Operative Coronary Artery Bypass Graft Patients

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Abstract

Purpose: Cardiopulmonary physiotherapy plays a crucial role in cardiac rehabilitation after surgeries. The deterioration of respiratory parameters occurs after coronary artery bypass grafting (CABG) procedure. Manual hyperinflation (MHI) is done according to clinical experiences and there are no specific guidelines for it. The objectives were to determine the effects of structured manual hyperinflation for improving respiratory parameters in post-operative CABG patients.

Methodology: Duration of study was 6 months (January 2019-June 2019) with a sample size of 76 post-operative CABG patients. Non-probability purposive sampling technique was used. Patients were divided into two groups' i-e MHI and VHI depending upon the treatment protocol. In protocol, endotracheal tube (ETT) suctioning was done followed by MHI and VHI in assigned group in randomized controlled trial design. Respiratory parameters were measured by ABG'S, equations for static lung compliance and alveolar-arterial oxygen

tension difference. Data was recorded pre and post ETT suctioning, immediately, 30 min and 60 min post intervention. Both males and females were included. Inclusion criteria involves patient must be intubated, hemodynamically and vitally stable, and age range 5577 years. Those were excluded who have past medical history of diagnosed pulmonary pathology and any post-operative complications. Patient was withdrawn from the study if any subject who have unstable cardiovascular status and high levels of respiratory support. Data was analyzed on SPSS 21.

Findings: All the respiratory parameters showed significant differences ($p<0.05$) in pre and post values of structured MHI. Significant difference ($p<0.05$) was observed immediately after intervention in terms of acidity (pH), partial pressure of carbon oxide (PaCO2), partial pressure of oxygen (PaO2), oxygen saturation and arterial oxygen to fraction of inspired oxygen ratio between the groups with scores higher for experimental group. HCO3 showed significant difference ($p<0.05$) immediately after intervention and 30 min and 60 min post intervention with the scores higher for control group. Static lung compliance showed significant difference ($p<0.05$) at 30 min and 60 min post intervention with scores higher for control group. Alveolar-arterial oxygen tension showed no significant difference ($p>0.05$) between the groups at any point. No significant difference ($p>0.05$) was observed between the groups at any other point of measurement for all respiratory parameters. MHI and VHI are both effective in improving respiratory parameters in post-operative CABG patients but the values were more significant in MHI group. But the difference between the groups was not significant and conclusive.

Unique Contribution to Theory, Practice and Policy: This study should be conducted in different patient populations having different pulmonary conditions and other types of cardiac surgeries and in other patients who are intubated and mechanically ventilated. Moreover, the effects of both techniques on different variables must be studied after multiple numbers of sessions during the whole period of intubation.

Keywords: *Manual Hyperinflation, Ventilator Hyperinflation, Respiratory Parameters*

INTRODUCTION

Coronary artery bypass graft (CABG) was first introduced in 1968. It is done in patients with severe coronary heart disease (CHD).[1] On a global scale, approximately 17.3 million people died of cardiovascular disease per year. Pakistan is listed in third world countries with a low-income population. A study conducted by WHO showed that approximately 80% of death in low income countries occurred due to cardiovascular disease and diabetes.[2]The ultimate broad goals of cardiopulmonary physical therapy treatment in the ICU includes prevention from any cardiopulmonary complications, having patient alert and oriented to person, time, and place, to make patient return to premorbid functional level to the greatest extent possible and to reduce morbidity, mortality and length of hospital stay.[3]

Bronchopulmonary complications are very common challenge faced by physiotherapist after CABG. Most respiratory dysfunction occurs at 48 hour and are partially recovered by fifth day.[4] The changes in lung volumes, capacities, oxygen saturation and arterial blood gases are seen in intubated patients.[5] The lung capacities are reduced by 30-60% and remain reduced by 12% for up to one year.[6, 7]. The etiology behind the worsening of pulmonary function after CABG has multiple factors such as reduction in rib cage expansion capacity, poor coordination in chest wall motion,[8] phrenic nerve injury that leads to diaphragmatic dysfunction, accumulation of pleural fluid and basal atelectasis.[9] Dysfunction of respiratory muscles is also the contributing factor for pulmonary function reduction. After CABG, the patient must be intubated until the condition is stabilized. The intubated patients are at higher risk of mucus retention in airways due to presence of endotracheal tube, administered drugs, muscle weakness, body positioning, less humidification of respiratory gases and immobility of patient.[10, 11] The retention of these secretions leads to serious respiratory complications.[12] Clinical algorithm of physiotherapy for pulmonary dysfunction involves reducing secretion during invasive ventilation, patient positioning, manual therapy and hyperinflation i-e for MHI < 7.5 cmH2O PEEP, and for VHI >7.5 cmH2O PEEP. In case of atelectasis patient positioning along with deep breathing and coughing with suctioning is recommended which is done by physiotherapist and suctioning by nurses. For ventilator associated pneumonia bed must be inclined at 30-40 degrees. In VAP, routine chest physiotherapy and open or close suctioning is not effective.[13]

Mostly cardiopulmonary physiotherapist utilizes manual or mechanical hyperinflation recruitment maneuvers for secretion clearance and improving respiratory parameters in intubated and mechanically ventilated patients[14] despite of the fact that there is lack of evidences that confirms the benefits of manual hyperinflation on clinical outcomes [15] as well as mechanical hyperinflation modes and its efficacy on clinical outcomes.[16]

Application of these recruitment maneuvers in mechanically assisted ventilated patients along with endotracheal suctioning are supposed to be beneficial. [17] However, delivery of tidal volumes and ventilator distribution is important physiological consideration while applying any type of lung hyperinflation techniques.[16, 18, 19] Endotracheal tube suctioning is a fundamental intervention in clearing airway secretions in patients who are on mechanical support. closed ETT suctioning is associated with less ABG's disturbances as compared to open ETT suctioning system and is also associated with maintenance of PaO2. [20-22].Manual hyperinflation is also known as "Bagging technique" as it engages the use of resuscitator bag to give larger tidal volumes and higher peak airway pressures but at slow rates of inflation along with the inspiratory pause. [23] There are number of circuits used to perform manual hyperinflation e.g. Magill circuit, [24] Laerdal circuit[25] and certain other types of Mapelson circuit systems. Some studies also suggest that Mapelson C system is more beneficial in improving respiratory parameters.[26]

Second hyperinflation recruitment maneuver is done via ventilator known as ventilator hyperinflation. It involves the manipulation of settings on ventilator parameters to provide tidal volume that must be larger than the baseline tidal volume.[27]

Matthew P.Linnane et al designed a study in 2019 to determine the effects of manual and ventilator hyperinflation on restoring lung volumes after endotracheal tube suctioning and the effects of both techniques on oxygenation. They performed a randomized crossover study on 9 patients. They performed endotracheal tube suctioning followed by manual and ventilator hyperinflations on these recruited patients. The results of their study showed that manual hyperinflation and ventilator hyperinflation are both effective in restoring lung volumes and must be considered after endotracheal tube suctioning. They also found that both techniques have no significant difference in improving respiratory parameters and oxygenation of patients.[28]. A survey was conducted in 2018 y K.O Donnel et al on ICU

based physiotherapist for the use of hyperinflation techniques. They concluded that there are no specific guidelines for the use of manual or mechanical hyperinflation in ICU patients who are ventilated and sedated. They also found that the physiotherapists who are applying manual hyperinflation techniques didn't know the volumes they are delivering and also the subjective measures. When applying MHI, clinical expertise and patient stability are important components to be determined.[29]

Previously, physiotherapist are using MHI but with varying degree of guidelines and according to their own expertise and experiences This study will help. The study aims to find out the effects of structured manual hyperinflation using Mapelson C circuit for improving respiratory parameters and ABG's after endotracheal tube suctioning in patients undergone coronary artery bypass graft in Pakistan.Previous studies have significant limitations related to protocol, equipment, outcome measures and the higher risk of biasness. There is no specifc guidelines for the use of manual hyperinflation in intubated patients about the delivering volumes and subjective measures. Moreover, few studies clearly reported the changes in arterial blood gases and respiratory parameters after structured manual hyperinflation. Furthermore, previously the Mapelson B system was used for manual hyperinflation. Both Mapelson B and C systems are similar apart from that the B system having tubing between the reservoir bag and the fresh gas flow, which further acts as a reservoir. It was important to investigate the effects of MHI and VHI to achieve desired effects in ICU patients**.** By using randomized control trials, this study investigated the effects of structured MHI for improving respiratory parameters such as static lung compliance, alveolar-arterial oxygen tension difference and arterial oxygen to fraction of inspired oxygen ratio and ABG's after endotracheal tube suctioning.

METHODOLOGY

It was randomized control trial with sample size of 76 (38 for each group) post-operative CABG patients. Study duration was 6 Months (January 2019-June 2019) and data was collected from Bahria international hospital, Rawalpindi. Sampling techniques was Non-probability purposive sampling technique and randomization was done by sealed envelope method. Inclusion criteria was Intubated, hemodynamically and vitally stable both males and females with age range of 55-77 years. Exclusion criteria was any past medical history included conditions that may have influenced lung compliance, severe asthma, severe chronic airflow limitation (CAL), any diagnosed pulmonary pathology

and patient with post-operative complications e.g pulmonary hypertension, prolonged bypass time and sepsis. Withdrawal criteria was any subject who have unstable cardiovascular status (systolic blood pressure [SBP] <100 or >180 mmHg or mean arterial pressure [MAP] <60 or >110 mmHg), arrhythmias which compromise cardiovascular function, presence of a pneumothorax, excessive blood loss from subcostal catheters (>100 ml/hour), high levels of respiratory support (fraction of inspired oxygen [FIO2] > 0.7 and positive end expiratory pressure [PEEP] >7.5 cmH20)

Treatment Protocol

Single session of protocol was given in each group and immediate effects were noted. Protocol was applied approximately three to four hours after the surgery. During the time of measurements, administered drugs, patient position and mechanical support was kept constant. All the descriptive and operative data was recorded.

Physiotherapy Protocol Prior to Interventions

Before treatment, baseline measurements were recorded. Prior to hyperinflation techniques, percussion, vibration and ETT suctioning of the patient were performed. The patient was first moved to modified postural drainage (30° head up) position [30] and nebulization was done via ventilator.

Percussion and vibration was performed in the 45° supine position, while slightly laterally lying. [31] The lung was then drained using percussion and vibration. Percussion was given on the chest wall. The hand was cupped properly as if to hold water but with the palm facing down so that percussion was less painful for patient. The cupped hand curved to the chest wall and trapped a cushion of air to soften the clapping. It was done with steady beat. The physiotherapist took percussive movement with wrist and relaxed arm so that it's less tiring for physiotherapist and more effective for patient.

After percussion, vibration was done with the flattened hand. The physiotherapist placed a firm hand on the chest wall and tensed the muscles of the arm and shoulder and created a fine shaking motion then, applied a light pressure over the area being vibrated. Percussion was done for three minutes and followed by vibration over the same area for approximately 15 seconds, and then endotracheal aspiration was performed in the supine position. [32] Special attention was given in performing percussion and vibration so that it didn't affect the sternotomy wound and sternum.

ETT suctioning was done with closed ETT suctioning system and the size of catheter used for suctioning was standardized. In patients whose endotracheal tube diameter was 7.0-8.5mm, 12F catheter was used and in patients whose tube internal diameter was 9.0-9.5mm, 14F catheter was used. The patient was pre-oxygenated with 100% FiO2 for about 2 min. Suction was done twice. Each suction catheter administration was done for six seconds and there was five second interval between both suctions. Suction was continuous and negative pressure of 150mmHg was applied at the time of suction catheter withdraw. After ETT suctioning, set of baseline measurements was recorded. MHI and VHI were then performed as per randomization order. [28]

Experimental Group

MHI was done in supine position with Mapleson C circuit system which has manometer in line and the flow of oxygen was set at 15L/min. The recruited patients received four sets; each comprised of one minute and consisted of eight hyperinflation breaths. Prior to give hyperinflation breath, physiotherapist washed hands and prepared equipment. Mapleson C bag was attached to 15L/min via the O2 port. Manometer was connected. Leaks in the bag or other faults were checked prior to attaching the bag to the patient. The expiratory valve was closed maximally and compressed the bag to assess that there are no functional concerns with the apparatus. Connect the Mapleson C bag to the endotracheal tube via the catheter mount.

The bag was positioned securely to minimize the amount of movement or drag, which will take place in the apparatus. Patient was positioned supine while Performing MHI breaths. Each breath had three seconds of inspiration to peak inspiratory pressure of 35-40cmH2O along with two seconds of inspiratory pause. Decompression of the bag was released quickly to simulate the forced expiratory technique. Full passive expiration was allowed prior to next MHI. In between each MHI set, patients received tidal breathing for 1 minute which was same as respiratory rate and PIP was given by ventilator at baseline. Ventilatory support was restored; ensuring adequate tidal volume and minute volume were maintained. Cardiovascular status and vital signs were monitored throughout the process. The data was recorded immediately after MHI and then 30 minutes and 60 minutes post MHI.[28]

Control Group

VHI was done in supine position in synchronized intermittent mandatory ventilation with volume control mode. The FiO2 was increased to 100%, and the respiratory rate was decreased to eight breaths per minute and inspiratory

flow rate was reduced to 20 L/min. the tidal volume was increased until PIP reached 35-40 cmH2O. When the target pressure was achieved, the tidal volume was kept constant for eight breaths along with 2 seconds of inspiratory pause. VHI was given in four sets of one-minute duration. In between each set, patients received tidal breathing for 1 minute which was same as the baseline parameters of ventilation. [28] PEEP and pressure support setting was remained unchanged during the whole study. Data was collected immediately after VHI and then 30 minutes and 60 minutes post VHI. All the ETT suctioning, MHI and VHI interventions was done by same physiotherapist.

Consort Diagram

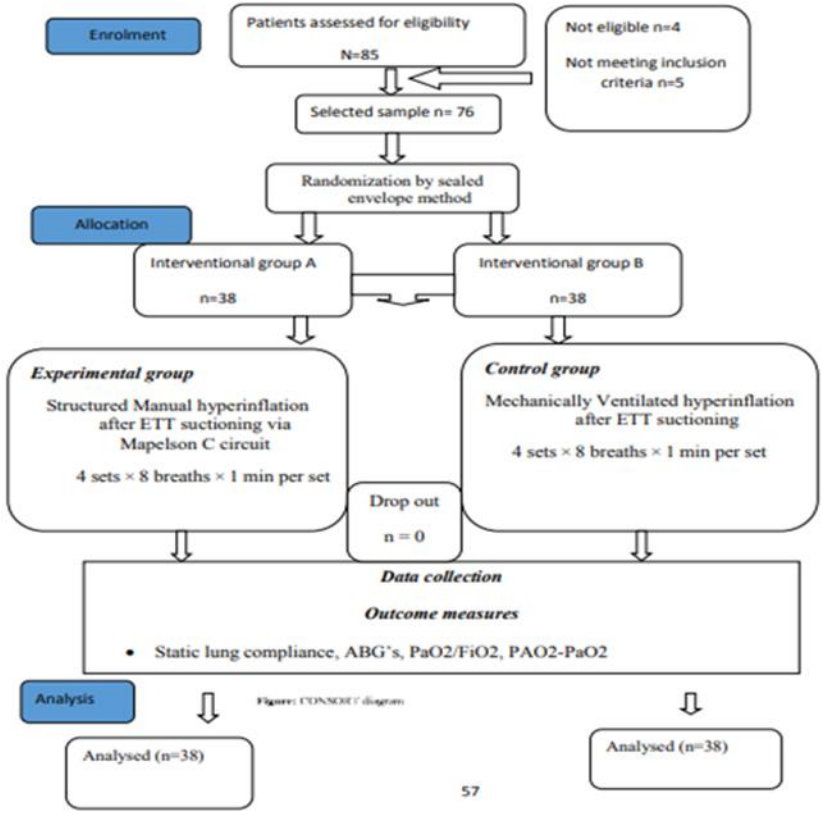

Figure 1: Consort Diagram

FINDINGS

Participant Characteristics and Demographics

Normality of participant characteristics and demographic information in both the groups was determined using Shapiro-Wilk test of normality. If either one of the two groups exhibited distribution that was not normal for a single variable, non-parametric test of significance (Mann Whitney U test) was used for inter group comparison and averages were reported in the form of Median (IQR). On the other hand, if both the groups exhibited normal distribution averages was reported in the form of Mean (S.D) and parametric test of significance (Independent t-test) was used for inter-group comparison. Only Body Mass Index (BMI) and tidal volume were found to be normally distributed ($p>0.05$), and all other variables were found not have a normal distribution ($p<0.05$) (Table 1).

Moreover, in terms of inter group comparison of participant characteristics and demographics no significant differences were observed between any of the variables between the two groups indicating baseline similarity, except for positive end expiratory pressure and body mass index (Table 2).

Table 1: Normality Analysis of Baseline Participant Characteristics and Demographic Information Using Shapiro-Wilk Test of Normality

Variable	Group	Statistic	P-Value
Age	Manual Hyperinflation	.906	.004
	Mechanical Hyperinflation	.954	.123
BMI	Manual Hyperinflation	.965	.272
	Mechanical Hyperinflation	.975	.543
Time on Ventilator	Manual Hyperinflation	.860	.000
	Mechanical Hyperinflation	.854	.000
FiO2	Manual Hyperinflation	.866	.000
	Mechanical Hyperinflation	.924	.013
Tidal Volume	Manual Hyperinflation	.977	.610
	Mechanical Hyperinflation	.953	.114
Positive End Expiratory Pressure	Manual Hyperinflation	.746	.000
	Mechanical Hyperinflation	.689	.000
Pressure Support	Manual Hyperinflation	.443	.000
	Mechanical Hyperinflation	.473	.000
Inspiratory Flow Time	Manual Hyperinflation	.782	.000
	Mechanical Hyperinflation	.683	.000

Table 2: Comparison of Baseline Participant Characteristics and Demographic Information between Manual Hyperinflation and Mechanical Hyperinflation Using Mann-Whitney U Test and Independent T-Test. (*Indicates P-Values from Independent T-Test)

Variable	Manual Hyperinflation	Mechanical Hyperinflation	P-value
	Median (IQ)	Median (IQ)	
Age	72.00(4.50)	70.50(9.25)	0.387
Time on Ventilator	4.00(2.00)	4.50(2.00)	0.219
FiO2	68.00(5.50)	68.00(3.00)	0.549
Positive End Expiratory Pressure	5.00(1.00)	7.00(1.00)	<0.001
Pressure Support	15.00(1.00)	15.00(0.00)	0.306
Inspiratory Flow Time	62.50(5.50)	60.00(5.00)	0.240
	Mean (S.D)	Mean (S.D)	
BMI	22.11(4.43)	23.82(3.94)	0.019*
Tidal Volume	**506.89(19.18)**	**502.61(17.61)**	**0.313***

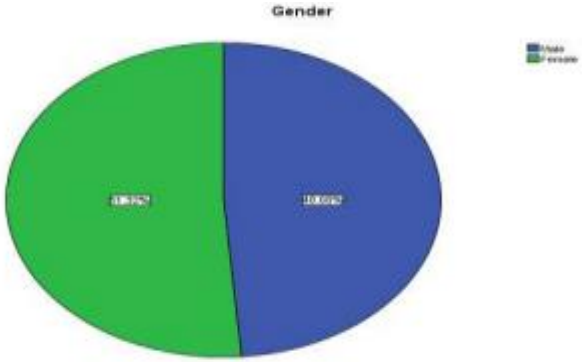

Figure 2: Distribution of Study Participants on Basis of Gender

Inter and Intra Group Comparison

Normality of variables in both the groups was determined using Shapiro-Wilk test of normality. If either one of the two groups exhibited distribution that was not normal for a single variable, non-parametric tests of significance (Mann Whitney U test and Friedman test) were used for inter and intra group comparison and averages were reported in the form of Median (IQR). On the other hand, if both the groups exhibited normal distribution averages was

reported in the form of Mean (S.D) and parametric tests of significance (Independent t-test and Repeated measures ANOVA) were used for inter-group and intra group comparison pH:

A p-value of less than 0.05 showed all the variables not having a normal distribution and non-parametric tests of significance were used (Table 3). Moreover, in terms of inter group comparison of participant pH scores no significant differences were observed between any of the variables between the two groups, except for pH scores immediately after intervention (Table 4).

In terms of pre and post analysis of pH of the participants in the manual hyperinflation group, as pH scores at all of the points of measurements were not normally distributed, non-parametric test of significance (Friedman test) was used and a p-value of less than 0.05 indicated a significant difference between the pH scores for the participants in the manual hyperinflation group at different points of measurement (Fig.2)

Table 3: Normality Analysis of PH of Participants Using Shapiro-Wilk Test of Normality

Variable	Group	Statistic	Sig.
pH (Pre endotracheal tube suctioning value)	Manual Hyperinflation	.932	.023
	Mechanical Hyperinflation	.965	.284
pH (Post endotracheal tube suctioning value)	Manual Hyperinflation	.929	.019
	Mechanical Hyperinflation	.919	.009
pH (Immediately after intervention)	Manual Hyperinflation	.884	.001
	Mechanical Hyperinflation	.963	.232
pH (30 mins post intervention)	Manual Hyperinflation	.929	.019
	Mechanical Hyperinflation	.946	.063
pH (60 mins post intervention)	Manual Hyperinflation	.942	.049
	Mechanical Hyperinflation	.946	.063

Table 4: Comparison of PH of Participants between Manual Hyperinflation and Mechanical Hyperinflation Using Mann-Whitney U-Test

Variable	Manual Hyperinflation	Mechanical Hyperinflation	P-value
	Median (IQR)	Median (IQR)	
pH (Pre endotracheal tube suctioning value)	7.38 (0.03)	7.38 (0.03)	0.685
pH (Post endotracheal tube suctioning value)	7.35 (0.02)	7.36 (0.03)	0.983
pH (Immediately after intervention)	7.39 (0.02)	7.38 (0.02)	0.006
pH (30 mins post intervention)	7.38 (0.03)	7.38 (0.03)	0.302
pH (60 mins post intervention)	7.38 (0.02)	7.38 (0.03)	0.276

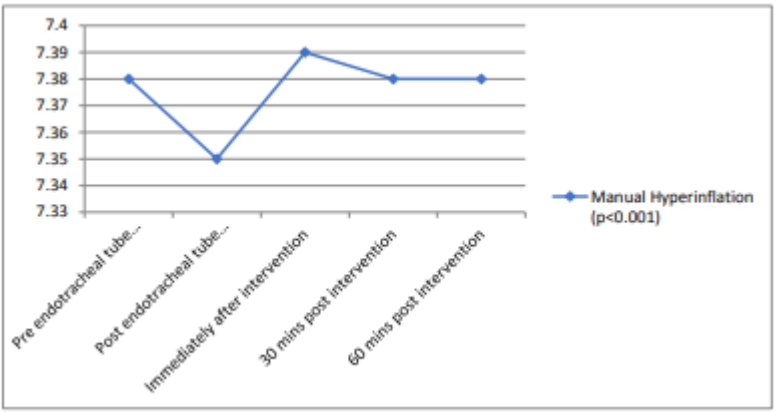

Figure 3: Pre and Post Analysis of PH Scores of Participants in the Manual Hyperinflation Group Using Friedman Test

pCO2

A p-value of less than 0.05 was observed only for pre endotracheal suctioning and immediately after intervention scores (Table 5). Moreover, in terms of inter group comparison of participant pCO2 scores no significant differences were observed between any of the variables between the two groups, except for pCO2 scores immediately after intervention (Table 6).

In terms of pre and post analysis of pCO2 of the participants in the manual hyperinflation group, as pCO2 scores at all of the points of measurements were not normally distributed, non-parametric test of significance (Friedman test) was used and a p-value of less than 0.05 indicated a significant difference between the pCO2 scores for the participants in the manual hyperinflation group at different points of measurement (Fig. 3).

Table 5: Normality Analysis of pCO2 of Using Shapiro-Wilk Test of Normality

Variable	Group	Statistic	P-value
pCO2 (Pre endotracheal tube suctioning value)	Manual Hyperinflation	.954	.121
	Mechanical Hyperinflation	.932	.023
pCO2 (Post endotracheal tube suctioning value)	Manual Hyperinflation	.954	.120
	Mechanical Hyperinflation	.961	.209
pCO2 (Immediately after intervention)	Manual Hyperinflation	.833	.000
	Mechanical Hyperinflation	.905	.003
pCO2 (30 mins post intervention)	Manual Hyperinflation	.969	.378
	Mechanical Hyperinflation	.949	.082
pCO2 (60 mins post intervention)	Manual Hyperinflation	.969	.378
	Mechanical Hyperinflation	.949	.082

Table 6: Comparison of pCO2 of Participants between Manual Hyperinflation and Mechanical Hyperinflation Using Mann-Whitney U-test and Independent T-test. (*Indicates P-Values from Independent T-Test)

Variable	Manual Hyperinflation	Mechanical Hyperinflation	P-value
	Median (IQR)	**Median (IQR)**	
pCO2 (Pre endotracheal tube suctioning value)	39.00(3.00)	39.00(4.00)	0.929
	Mean (S.D)	**Mean (S.D)**	
pCO2 (Post endotracheal tube suctioning value)	40.97(2.19)	40.97(2.70)	0.100*
	Median (IQR)	**Median (IQR)**	
pCO2 (Immediately after intervention)	45.00(2.00)	43.00(3.25)	<0.001
	Mean (S.D)	**Mean (S.D)**	
pCO2 (30 mins post intervention)	39.84(2.05)	39.47(2.75)	0.510*
pCO2 (60 mins post intervention)	39.84(2.05)	39.47(2.75)	0.510*

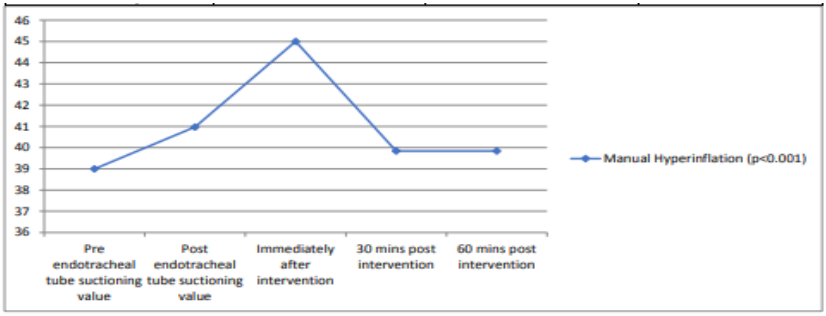

Figure 4: Pre and Post Analysis of pCO2 Scores of Participants in the Manual Hyperinflation Group Using Friedman Test

pO2

A p-value of less than 0.05 showed all the variables not having a normal distribution and non-parametric tests of significance were used (Table 7). Moreover, in terms of inter group comparison of participant pO2 scores, no significant differences were observed between any of the variables between the two groups, except for pO2 scores immediately after intervention (Table 8).

In terms of pre and post analysis of pO2 of the participants in the manual hyperinflation group, as pO2 scores at all of the points of measurements were not normally distributed, non-parametric test of significance (Friedman test) was used and a p-value of less than 0.05 indicated a significant difference between the pO2 scores for the participants in the manual hyperinflation group at different points of measurement (Fig. 4).

Table 7: Normality Analysis of pO2 of Using Shapiro-Wilk Test of Normality

Variable	Group	Statistic	Sig.
pO2 (Pre endotracheal tube suctioning value)	Manual Hyperinflation	.894	.002
	Mechanical Hyperinflation	.874	.001
pO2 (Post endotracheal tube suctioning value)	Manual Hyperinflation	.959	.171
	Mechanical Hyperinflation	.925	.014
pO2 (Immediately after intervention)	Manual Hyperinflation	.904	.003
	Mechanical Hyperinflation	.909	.005
pO2 (30 mins post intervention)	Manual Hyperinflation	.901	.003
	Mechanical Hyperinflation	.947	.072
pO2 (60 mins post intervention)	Manual Hyperinflation	.901	.003
	Mechanical Hyperinflation	.947	.072

Table 8: Comparison of pO2 of Participants between Manual Hyperinflation and Mechanical Hyperinflation Using Mann-Whitney U-Test

	Manual Hyperinflation	Mechanical Hyperinflation	
Variable	**Median (IQR)**	**Median (IQR)**	**P-value**
pO2 (Pre endotracheal tube suctioning value)	97.00(8.50)	98.00(7.5)	0.442
pO2 (Post endotracheal tube suctioning value)	92.50(7.25)	92.50(6.50)	0.700
pO2 (Immediately after intervention)	100.50(6.15)	98.00(7.00)	<0.001
pO2 (30 mins post intervention)	98.00(7.50)	100.00(8.00)	0.243
pO2 (60 mins post intervention)	98.00(7.50)	100.00(8.00)	0.243

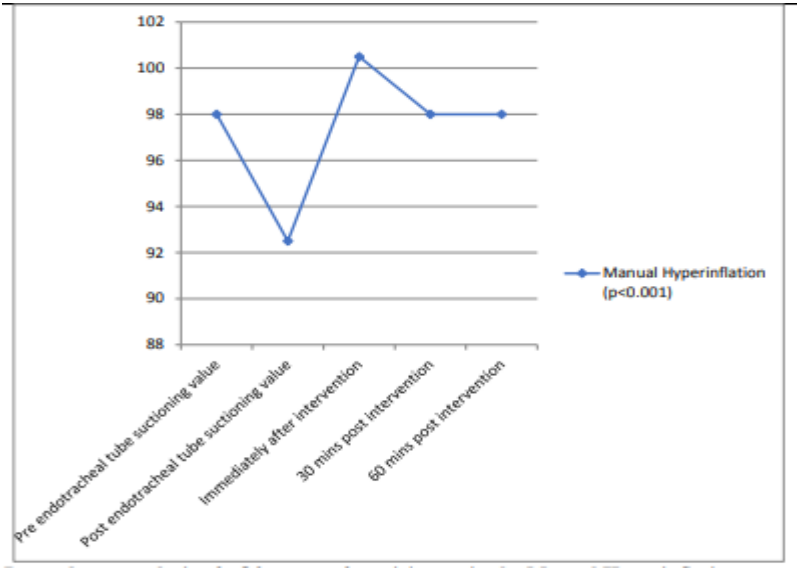

Figure 5: Pre and Post Analysis of pO2 Scores of Participants in the Manual Hyperinflation Group Using Friedman Test

HCO3:

A p-value of less than 0.05 showed all the variables not having a normal distribution and non-parametric tests of significance were used (Table 9). Moreover, in terms of inter group comparison of participant HCO3 scores, a significant difference was observed between the two groups, at immediately after intervention, 30 minutes after intervention and 60 minutes after intervention (Table 10).

In terms of pre and post analysis of HCO3 of the participants in the manual hyperinflation group, as HCO3 scores at all of the points of measurements were not normally distributed, non-parametric test of significance (Friedman test) was used and a p-value of less than 0.05 indicated a significant difference between the HCO3 scores for the participants in the manual hyperinflation group at different points of measurement (Fig. 5).

Table 9: Normality Analysis of HCO3 Using Shapiro-Wilk Test of Normality

Variable	Group	Statistic	Sig.
HCO3 (Pre endotracheal tube suctioning value)	Manual Hyperinflation	.905	.004
	Mechanical Hyperinflation	.912	.006
HCO3 (Post endotracheal tube suctioning value)	Manual Hyperinflation	.911	.005
	Mechanical Hyperinflation	.895	.002
HCO3 (Immediately after intervention)	Manual Hyperinflation	.930	.020
	Mechanical Hyperinflation	.925	.014
HCO3 (30 mins post intervention)	Manual Hyperinflation	.914	.007
	Mechanical Hyperinflation	.913	.006

Table 10: Comparison of HCO3 of Participants between Manual Hyperinflation and Mechanical Hyperinflation Using Mann-Whitney U Test

Variable	Manual Hyperinflation	Mechanical Hyperinflation	P-value
	Median (IQR)	Median (IQR)	
HCO3 (Pre endotracheal tube suctioning value)	24.00(1.48)	24.00(1.25)	0.122
HCO3 (Post endotracheal tube suctioning value)	25.00(1.25)	25.00(1.00)	0.30
HCO3 (Immediately after intervention)	23.00(1.00)	24.00(1.00)	0.003
HCO3 (30 mins post intervention)	23.00(2.25)	24.00(1.00)	0.003
HCO3 (60 mins post intervention)	23.00(2.25)	24.00(1.00)	0.002

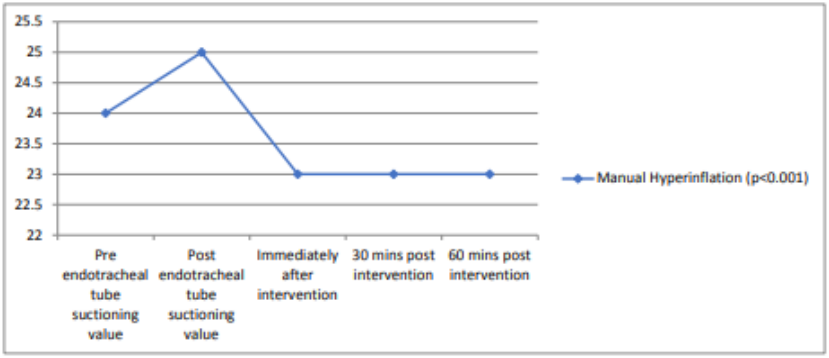

Figure 6: Pre and Post Analysis of HCO3 Scores of Participants in the Manual Hyperinflation Group Using Friedman Test

Oxygen Saturation

A p-value of less than 0.05 showed all the variables not having a normal distribution and non-parametric tests of significance were used (Table 11).

Moreover, in terms of inter group comparison of participant oxygen scores no significant differences were observed between any of the variables between the two groups, except for oxygen saturation scores immediately after intervention (Table 12).

In terms of pre and post analysis of oxygen saturation of the participants in the manual hyperinflation group, as oxygen saturation scores at all of the points of measurements were not normally distributed, non-parametric test of significance (Friedman test) was used and a p-value of less than 0.05 indicated a significant difference between the oxygen saturation scores for the participants in the manual hyperinflation group at different points of measurement (Fig. 6).

Table 11: Normality Analysis of Oxygen Saturation Using Shapiro-Wilk Test of Normality

Variable	Group	Statistic	P-value
Sat O2 (Pre endotracheal tube suctioning value)	Manual Hyperinflation	.873	.000
	Mechanical Hyperinflation	.848	.000
Sat O2 (Post endotracheal tube suctioning value)	Manual Hyperinflation	.918	.008
	Mechanical Hyperinflation	.843	.000
Sat O2 (Immediately after intervention)	Manual Hyperinflation	.452	.000
	Mechanical Hyperinflation	.844	.000
Sat O2 (30 mins post intervention)	Manual Hyperinflation	.817	.000
	Mechanical Hyperinflation	.856	.000
Sat O2 (60 mins post intervention)	Manual Hyperinflation	.797	.000
	Mechanical Hyperinflation	.195	.000

Table 12: Comparison of Oxygen Saturation of Participants between Manual Hyperinflation and Mechanical Hyperinflation Using Mann-Whitney U-Test

Variable	Manual Hyperinflation	Mechanical Hyperinflation	P-value
	Median (IQR)	Median (IQR)	
Sat O2 (Pre endotracheal tube suctioning value)	98.00(1.00)	98.00(2.00)	0.308
Sat O2 (Post endotracheal tube suctioning value)	96.00(2.00)	96.00(2.00)	0.774
Sat O2 (Immediately after intervention)	100.00(2.00)	99.00(1.00)	<0.001
Sat O2 (30 mins post intervention)	98.00(0.25)	98.00(2.00)	0.920
Sat O2 (60 mins post intervention)	98.00(0.25)	98.00(2.00)	0.611

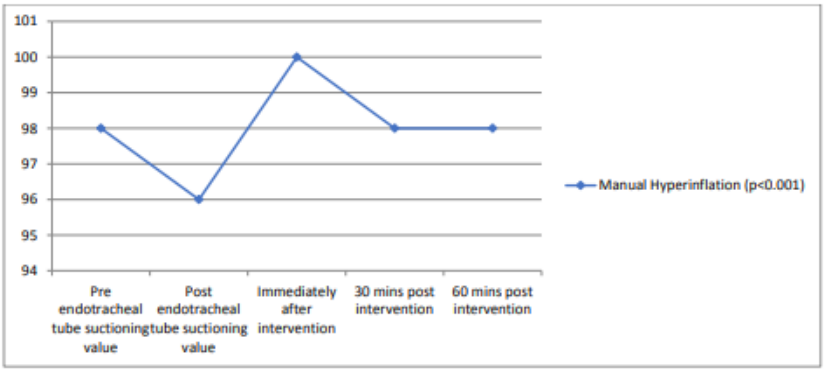

Figure 7: Pre and Post Analysis of Oxygen Saturation Scores of Participants in the Manual Hyperinflation Group Using Friedman Test

Static Lung Compliance

A p-value of less than 0.05 showed all the variables not having a normal distribution and non-parametric tests of significance were used (Table 13).

Moreover, in terms of inter group comparison of participant static lung compliance scores were found to have a significant difference at 30- and 60-minutes post intervention only (Table 14).

In terms of pre and post analysis of static lung compliance of the participants in the manual hyperinflation group, as static lung compliance scores at all of the points of measurements were not normally distributed, non-parametric test of significance (Friedman test) was used and a p-value of less than 0.05 indicated a significant difference between the static lung compliance scores for the participants in the manual hyperinflation group at different points of measurement (Figure. 7).

Table 13: Normality Analysis of Static Lung Compliance Using Shapiro-Wilk Test of Normality

Variable	Group	Statistic	Sig.
Static lung compliance (Pre endotracheal tube suctioning value)	Manual Hyperinflation	.943	.054
	Mechanical Hyperinflation	.949	.083
Static lung compliance (Post endotracheal tube suctioning value)	Manual Hyperinflation	.943	.053
	Mechanical Hyperinflation	.949	.081
Static lung compliance (Immediately after intervention)	Manual Hyperinflation	.929	.018
	Mechanical Hyperinflation	.950	.087
Static lung compliance (30 mins post intervention)	Manual Hyperinflation	.929	.018
	Mechanical Hyperinflation	.942	.048
Static lung compliance (60 mins post intervention)	Manual Hyperinflation	.929	.018
	Mechanical Hyperinflation	.950	.087

Table 14: Comparison of Static Lung Compliance of Participants between Manual Hyperinflation and Mechanical Hyperinflation Using Mann-Whitney U-test

Variable	Manual Hyperinflation	Mechanical Hyperinflation	P-value
	Median (IQR)	Median (IQR)	
Static lung compliance (Pre endotracheal tube suctioning value)	16.20(0.98)	16.51(1.03)	0.057
Static lung compliance (Post endotracheal tube suctioning value)	16.18(1.00)	16.47(1.03)	0.057
Static lung compliance (Immediately after intervention)	16.28(0.98)	16.55(1.00)	0.089
Static lung compliance (30 mins post intervention)	19.18(0.98)	21.45(1.00)	<0.001
Static lung compliance (60 mins post intervention)	19.18(0.98)	21.45(1.00)	<0.001

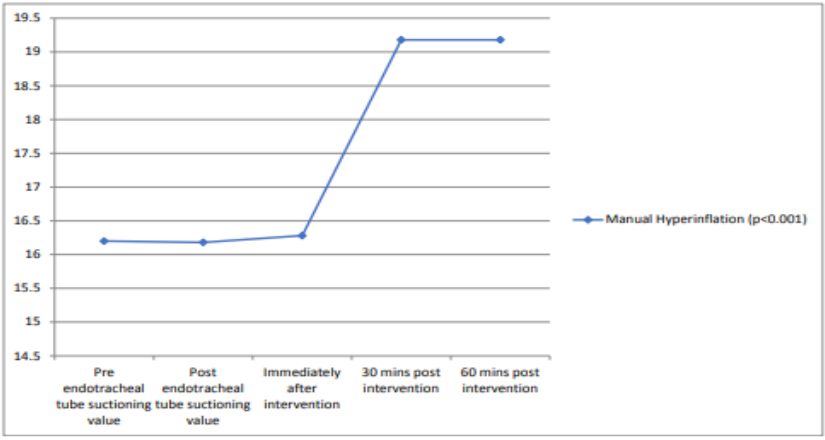

Figure 8: Pre and Post Analysis of Static Lung Compliance Scores of Participants in the Manual Hyperinflation Group Using Friedman Test

pO2:FiO2:

A p-value of less than 0.05 showed all the variables not having a normal distribution and non-parametric tests of significance were used (Table 15). Moreover, in terms of inter group comparison of participant pO2:FiO2 scores

no significant differences were observed between any of the variables between the two groups, except for pH scores immediately after intervention (Table 16).

In terms of pre and post analysis of pO2:FiO2 of the participants in the manual hyperinflation group, as pO2:FiO2 scores at all of the points of measurements were not normally distributed, non-parametric test of significance (Friedman test) was used and a p-value of less than 0.05 indicated a significant difference between the pO2:FiO2 scores for the participants in the manual hyperinflation group at different points of measurement (Fig. 8).

Table 15: Normality Analysis of pO2:pFiO2 of Using Shapiro-Wilk Test of Normality

Variable	Group	Statistic	P-value
pO2:FiO2 (Pre endotracheal tube suctioning value)	Manual Hyperinflation	.894	.002
	Mechanical Hyperinflation	.621	.000
pO2:FiO2 (Post endotracheal tube suctioning value)	Manual Hyperinflation	.944	.058
	Mechanical Hyperinflation	.917	.008
pO2:FiO2 (Immediately after intervention)	Manual Hyperinflation	.942	.049
	Mechanical Hyperinflation	.906	.004
pO2:FiO2 (30 mins post intervention)	Manual Hyperinflation	.894	.002
	Mechanical Hyperinflation	.961	.199
pO2:FiO2 (60 mins post intervention)	Manual Hyperinflation	.894	.002
	Mechanical Hyperinflation	.961	.199

Table 16: Comparison of pO2:FiO2 of Participants between Manual Hyperinflation and Mechanical Hyperinflation Using Mann-Whitney U-Test

Variable	Manual Hyperinflation	Mechanical Hyperinflation	P-value
	Median (IQR)	Median (IQR)	
pO2:FiO2 (Pre endotracheal tube suctioning value)	143.06 (26.85)	143.38(16.17)	0.339
pO2:FiO2 (Post endotracheal tube suctioning value)	136.03(21.39)	136.29(14.23)	0.540
pO2:FiO2 (Immediately after intervention)	147.79(17.67)	143.70(14.83)	0.008
pO2:FiO2 (30 mins post intervention)	143.38(26.02)	147.38(16.65)	0.659
pO2:FiO2 (60 mins post intervention)	143.38(26.02)	147.38(16.65)	0.659

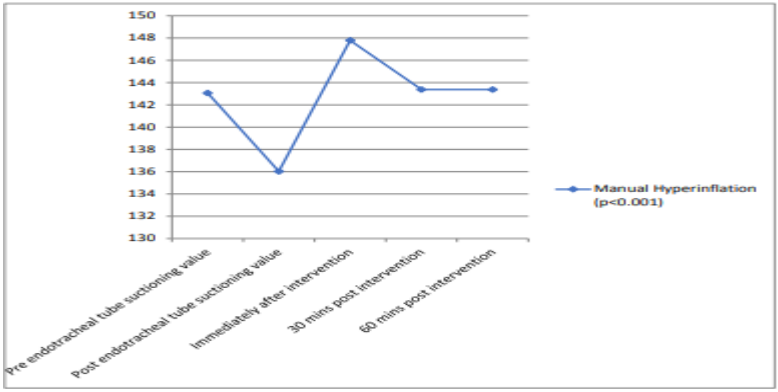

Figure 9: Pre and Post Analysis of pO2:FiO2 Scores of Participants in the Manual Hyperinflation Group Using Friedman Test

Alveolar-Arterial Oxygen Tension

A p-value of less than 0.05 showed all the variables not having a normal distribution and non-parametric tests of significance were used (Table17). Moreover, in terms of inter group comparison of participant alveolararterial oxygen tension scores no significant differences were observed between any of the variables between the two groups (Table18).

In terms of pre and post analysis of alveolar-arterial oxygen tension of the participants in the manual hyperinflation group, as alveolar-arterial oxygen tension scores at all of the points of measurements were not normally distributed, non-parametric test of significance (Friedman test) was used and a p-value of less than 0.05 indicated a significant difference between the alveolar-arterial oxygen tension scores for the participants in the manual hyperinflation group at different points of measurement (Fig. 9).

Table 17: Normality Analysis of Alveolar-Arterial Oxygen Tension of Using Shapiro-Wilk Test of Normality

Variable	Group	Statistic	Sig.
Alveolar-Arterial oxygen tension (Pre endotracheal tube suctioning value)	Manual Hyperinflation	.916	.007
	Mechanical Hyperinflation	.926	.015
Alveolar-Arterial oxygen tension (Post endotracheal tube suctioning value)	Manual Hyperinflation	.908	.004
	Mechanical Hyperinflation	.930	.019
Alveolar-Arterial oxygen tension (Immediately after intervention)	Manual Hyperinflation	.918	.008
	Mechanical Hyperinflation	.944	.056
Alveolar-Arterial oxygen tension (30 mins post intervention)	Manual Hyperinflation	.918	.008
	Mechanical Hyperinflation	.924	.013
Alveolar-Arterial oxygen tension (60 mins post intervention)	Manual Hyperinflation	.918	.008
	Mechanical Hyperinflation	.924	.013

Table 18: Comparison of Alveolar-Arterial Oxygen Tension of Participants between Manual Hyperinflation and Mechanical Hyperinflation Using Mann-Whitney U-Test

Variable	Manual Hyperinflation	Mechanical Hyperinflation	P-value
	Median (IQR)	Median (IQR)	
Alveolar-Arterial oxygen tension (Pre endotracheal tube suctioning value)	337.09(51.03)	337.09(26.55)	0.596
Alveolar-Arterial oxygen tension (Post endotracheal tube suctioning value)	339.34(47.97)	338.72(29.36)	0.557
Alveolar-Arterial oxygen tension (Immediately after intervention)	328.22(46.62)	331.78(27.17)	0.067
Alveolar-Arterial oxygen tension (30 mins post intervention)	335.34(50.34)	333.72(27.24)	0.823
Alveolar-Arterial oxygen tension (60 mins post intervention)	335.34 (50.34)	333.72(27.24)	0.823

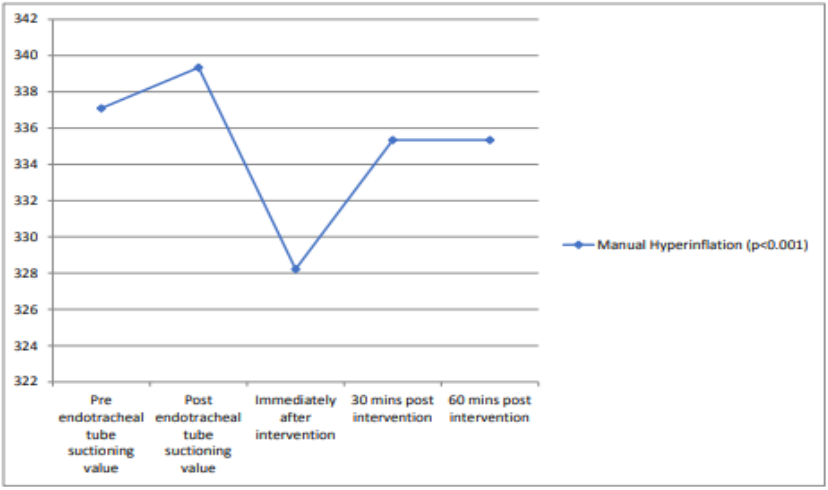

Figure 10: Pre and Post Analysis of Alveolar-Arterial Oxygen Tension Scores of Participants in the Manual Hyperinflation Group Using Friedman Test

Discussion

Manual hyperinflation is a commonly used technique in the management of critically ill, mechanically ventilated and intubated patients [19]. Mechanical ventilation causes movement of secretions from smaller to larger airways [33, 34], resulting in removal of secretions with airway suction [19]. The current study was conducted to determine the effects of structured manual hyperinflation in post-operative coronary artery bypass graft (CABG) patients following endotracheal tube suctioning, to improve respiratory parameters as well as arterial blood gases (ABGs) including pH, pCO2, pO2, oxygen saturation, bicarbonate , alveolararterial oxygen tension, static lung compliance and pO2:FiO2. Literature has shown manual hyperinflation to be effective in terms of improving airway secretion clearance, pulmonary compliance, pO2, oxygen saturation, decreased cardiac output, diastolic blood pressure, systemic vascular resistance, alveolar-arterial oxygen tension, increased central venous pressure, and decreased hear rate [19, 35-39]. On the other hand literature has shown no improvement of manual hyperinflation in terms of cardiac output, airway secretion clearance, oxygen saturation, heart rate, incidence of pneumonia, cardiac output, incidence of pneumonia, pulmonary compliance, pO2, systemic blood pressure, central venous pressure, pulmonary artery wedge pressure, oxygen saturation or decreased length of stay in the intensive care unit (ICU) [19, 40, 41]. In terms of the current study however, a significant difference ($p<0.05$) was observed in terms of pre and post intervention scores of all outcome variables including pH, pCO2, pO2, oxygen saturation, bicarbonate, alveolar-arterial oxygen tension, static lung compliance and pO2:FiO2 in post CABG patients that received structured manual hyperinflation.

A study conducted by Hodgson et al determined the effects of manual hyperinflation in critically ill patients in terms of sputum clearance, gaseous exchange, mean arterial pressure, pulmonary compliance and heart rate. The study found significant improvements in pulmonary compliance, sputum clearance, mean arterial pressure, heart rate, pCO2 and pO2:FiO2 [35]. These findings were in accordance with the current study which also showed significant improvements in pCO2 and pO2:FiO2. In the current study pCO2 increased significantly on measuring immediately post structured manual hyperinflation intervention and then slightly decreased back again after 30 minutes and then stagnated when measured again at 60 minutes. This is similar to the findings of Hodgson et al study in which pCO2 increased significantly post manual hyperinflation and then again decreased slightly when measured

at 20 minutes post intervention [35]. Similarly, in terms of pO2:FiO2 scores, the pO2:FiO2 increased significantly on measuring immediately post structured manual hyperinflation intervention and then slightly decreased back again after 30 minutes and then stagnated when measured again at 60 minutes. This was once again in accordance with Hodgson's study in which pO2:FiO2 increased significant post manual hyperinflation and then again decreased slightly when measured at 20 minutes post intervention [35].

Another study conducted by Patman et al determined the effects of manual hyperinflation as compared to control in terms of pO2:FiO2, alveolar- arterial oxygen tension and lung compliance in patients who underwent coronary artery surgery, and were medically stable and mechanically ventilated [37]. The findings showed a significant improvement in pO2:FiO2, alveolar- arterial oxygen tension and lung compliance, and the measurements were taken immediately post intervention, and 5 minutes, 10 minutes, 20 minutes, 30 minutes and 60 minutes post intervention [37]. In Patman study pO2:FiO2 scores increased significantly on measuring immediately post manual hyperinflation intervention and then decreased back again at 5 and 10 minutes post intervention and then again increased at 30 minutes and then gradually stagnated when measured again at 60 minutes [37]. This was in accordance with the findings of the current study in which pO2:FiO2 increased significantly on measuring immediately post structured manual hyperinflation intervention and then slightly decreased back again after 30 minutes and then stagnated when measured again at 60 minutes; however, there were no measurements recorded and 5 and 10 minutes post intervention. Moreover, in terms of alveolar- arterial oxygen tension, Patman's study showed a remarkable decrease immediately post intervention which than increased slightly and gradually stagnated over 5, 10, 30 and 60 minutes respectively [37]. These findings are in perfect harmony with the findings of the current study in which a remarkable decrease was noted in alveolar- arterial oxygen tension immediately post intervention which than increased slightly and gradually stagnated over 30 and 60 minutes respectively; however there were no measurements recorded and 5 and 10 minutes post intervention in the current study.

A study conducted by Barker also evaluated the effects of manual hyperinflation, but the patients considered in the study were with acute lung injury. The outcome measures in this study included pCO2, pO2:FiO2, heart rate, lung compliance, oxygen saturation and blood pressure [38]. Measurements were recorded at baseline and 10, 30 and 60 minutes post

intervention[38] as compared to immediately after intervention, 30 and 60 minutes after intervention in the current study. In terms of pCO2 significant changes were noted in pre and post intervention scores ($p=0.026$) [38], similar to the findings of the current study ($p<0.001$). Moreover, significant changes were noted in terms of pre and post scores of oxygen saturation as well ($p<0.05$) [38], similar to the findings of the current study ($p<0.001$). However, no significant changes were reported in terms of pre and post intervention scores of pO2:FiO2 ($p>0.05$) [38], unlike the findings of the current study in which statistically significant changes were noted in the pre and post intervention scores of pO2:FiO2 ($p<0.001$). Moreover, in Baker study statistically significant changes were also reported in participants receiving manual hyperinflation in terms of heart rate and systemic blood pressure, however those changes were not clinically significant [38].

A study conducted by Blattner determined the effects of manual hyperinflation in patients following myocardial revascularization [39] and found pO2 to be 17.5 mmHg greater, and static lung compliance to be 8.5ml/cmH2O greater in the manual hyperinflation group than the control group. However, no significant differences were observed between the two groups in terms of relative risk of post-operative pulmonary complications [39]. These findings are in accordance with the current study which has also shown manual hyperinflation to be effective in terms of pre and post scores of pO2.

Another study conducted by Choi JSP et al determined the effects of manual hyperventilation on mechanically ventilated patients and found significantly positive effects of manual hyperinflation in terms of static lung compliance and inspiratory resistance, with an increase in static lung compliance and decrease in inspiratory resistance [36]. The measurements were recorded immediately and 30 minutes after manual hyperinflation similarly to the current study [36], however measurements were also recorded 60 minutes post intervention in the current study.

In addition to determining the effects of structured manual hyperinflation in post-operative CABG patients, the current study also compared the effects of structured manual hyperinflation and mechanical hyperinflation following endotracheal tube suctioning in post-operative CABG patients at pre endotracheal tube suctioning, post endotracheal tube suctioning, Immediately after intervention, 30 minutes post intervention and 60 minutes post intervention intervals. A significant difference ($p<0.05$) was observed between manual and mechanical hyperinflation groups only immediately after

intervention in terms of pH, pCO2, pO2, oxygen saturation and pO2:FiO2, with scores for manual hyperinflation group being higher than the mechanical hyperinflation group. Moreover, for HCO3 a significant difference ($p<0.05$) was noted immediately after intervention, 30 minutes post intervention and 60 minutes post intervention, and mechanical hyperinflation group scores were greater than manual hyperinflation group, and for static lung compliance scores in which there was a significant difference ($p<0.05$) at 30 minutes post intervention and 60 minutes post intervention, and mechanical hyperinflation group scores were greater than manual hyperinflation group. Alveolar-arterial to oxygen tension showed significant difference in structured manual hyperinflation group while it showed no significant results between the groups. Moreover, it is also imperative to point out that no significant difference ($p>0.05$) was observed between manual and mechanical hyperinflation at any other point of measurement.

A randomized controlled trial was conducted by Ahmed et al comparing the effects of manual and mechanical hyperinflation in post cardiac surgery patients, and found no significant differences ($p<0.05$) between the two groups in terms of static and dynamic lung compliance, pO2:FiO2, pCO2 and pH [42], which were in accordance with the findings of the current study as mentioned previously.

Another study conducted by Dennis et al compared the effects of manual and mechanical hyperinflation, but this time in intensive care unit patients in terms of sputum net weight, lung compliance, tidal volume, airway pressure and pO2:FiO2 [43]. The findings of this study showed no significant differences ($p<0.05$) in terms of sputum net weight, lung compliance, tidal volume, heart rate, respiratory rate and mean arterial pressure. However, a significant difference was observed between the manual and mechanical hyperinflation in terms of mean airway pressure and time dependent pO2:FiO2 ($p<0.05$) [43]. Just like the findings of the current study, in Dennis study as well both the interventions were found to be effective, but the results were no conclusive enough to establish one technique to be superior to the other.

Berney et al also conducted a research comparing the effects of manual and mechanical hyperinflation on ventilated intensive care patients in terms of static lung compliance. Even though both manual and mechanical hyperinflation were found to be significantly effective in terms of sputum production and static pulmonary compliance, however no significant differences were observed between the two treatment groups [18]. However,

in the current study a significant difference ($p<0.05$) was observed in terms of static lung compliance scores at 30 minutes post intervention and 60 minutes post intervention, in which mechanical hyperinflation group scores were found to be greater than manual hyperinflation group.

In light of the findings of the current study and the existing literature, it is safe to conclude that structured manual hyperinflation is an effective technique in improving lung compliance following endotracheal tube suctioning in post CABG patients, in terms of pH, pCO2, pO2, oxygen saturation, HCO3, static lung compliance and pO2:FiO2. There are significant differences in overall values of all variables in structured manual hyperinflation group at different intervals. Moreover, the differences between the two groups are not remarkable and conclusive but the values are comparatively higher for structured MHI group.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study indicates that both structured MHI and VHI are found to be effective in improving respiratory parameters following ETT suctioning. However, the results are much more significant in structured MHI. Furthermore, for improving static lung compliance, VHI is more effective. But the difference between the groups was not significant and conclusive.

Recommendations

This study should be conducted in different patient populations having different pulmonary conditions and other types of cardiac surgeries and in other patients who are intubated and mechanically ventilated. Moreover, the effects of both techniques on different variables must be studied after multiple numbers of sessions during the whole period of intubation. Furthermore, finding out the effects of both techniques on HCO3 using more appropriate apparatus and guidelines are also warranted.

Emerging Issues and Controversies

According to Al Mutairi, (2013), There may be ongoing debates regarding the actual efficacy of structured manual hyperinflation in improving respiratory parameters in post-operative CABG patients. Studies might show mixed results, making it challenging to establish clear guidelines for its routine use. Also, Controversies might revolve around the appropriate patient population for structured manual hyperinflation. Some argue that it may not be suitable for all post-CABG patients, and there could be a need for more refined criteria to identify those who would benefit the most.

Secondly, Assessing the risk-benefit balance of structured manual hyperinflation is crucial (Martínez et al 2005), There may be concerns about potential complications or adverse effects associated with this intervention, and weighing these risks against the benefits becomes a critical issue. Also, Controversies may arise regarding the standardization of techniques for manual hyperinflation. Different healthcare facilities and practitioners might employ varying methods, making it difficult to compare outcomes and establish best practices. Again, Researchers and clinicians may continue to explore alternative strategies for improving respiratory parameters in post-operative CABG patients, such as early mobilization, incentive spirometry, or different ventilation approaches. This could lead to discussions about which interventions are the most effective and practical.

Lastly, there might be debates about the long-term impact of structured manual hyperinflation on post-operative CABG patients (Al Mutairi, 2013), While short-term improvements in respiratory parameters may be observed, questions may arise regarding whether these interventions have lasting benefits or if they are merely transient. Also, ensuring that the use of structured manual hyperinflation is based on strong scientific evidence is crucial. Controversies may center around the need for high-quality randomized controlled trials and systematic reviews to guide clinical decision-making. Again, Collaboration among healthcare professionals, including surgeons, anesthesiologists, and respiratory therapists, is vital for managing post-operative CABG patients. Controversies may arise regarding the level of interdisciplinary coordination and communication necessary for optimizing patient care.

It's essential to keep in mind that medical knowledge is continually evolving, and new research findings may have emerged since my last update. Therefore, I recommend consulting the most recent clinical guidelines and consulting with

healthcare professionals to stay informed about the current state of practice in this area.

REFERENCES

1 Moss, E., et al., *Avoiding aortic clamping during coronary artery bypass grafting reduces postoperative stroke.* The Journal of thoracic and cardiovascular surgery, 2015. 149(1): p. 175-180.

2 Farogh, A., M.U.A. Shah, and S. Afshan, *Impact of preoperative diabetes mellitus on morbidity in patients undergoing coronary artery bypass graft surgery.* Pakistan Heart Journal, 2015. 48(3).

3 Westerdahl, E. and M. Möller, *Physiotherapy-supervised mobilization and exercise following cardiac surgery: a national questionnaire survey in Sweden.* Journal of cardiothoracic surgery, 2010. 5(1): p. 67.

4 Taggart, D.P., *Respiratory dysfunction after cardiac surgery: effects of avoiding cardiopulmonary bypass and the use of bilateral internal mammary arteries.* European journal of cardio-thoracic surgery, 2000. 18(1): p. 31-37.

5 Mamalyga, M.L., G.V. Lobacheva, and M.M. Alshibaya, *Recovery of Respiratory Function After Coronary Artery Bypass Graft Surgery Using Pep-Therapy.* Multidisciplinary Cardiovascular Annals, 2018(In Press).

6 Westerdahl, E., et al., *Pulmonary function 4 months after coronary artery bypass graft surgery.* Respiratory medicine, 2003. 97(4): p. 317-322.

7 Kristjansdottir, A., et al., *Chest wall motion and pulmonary function are more diminished following cardiac surgery when the internal mammary artery retractor is used.* Scandinavian Cardiovascular Journal, 2004. 38(6): p. 369-374.

8 Ragnarsdottir, M., et al., *Short‐term changes in pulmonary function and respiratory movements after cardiac surgery via median sternotomy.* Scandinavian Cardiovascular Journal, 2004. 38(1): p. 46-52.

9 Caso, G., et al., *Altered protein metabolism following coronary artery bypass graft (CABG) surgery.* Clinical Science, 2008. 114(4): p. 339-346.

10 Li Bassi, G., *Causes of secretion retention: patient factors, ventilation, devices, drugs.* Current Respiratory Medicine Reviews, 2014. 10(3): p. 143-150.

11 Branson, R.D., *Secretion management in the mechanically ventilated patient.* Respiratory care, 2007. 52(10): p. 1328-1347.

[12] Ntoumenopoulos, G., *Clinical impact of secretion retention.* Current Respiratory Medicine Reviews, 2014. 10(3): p. 158-162.
[13] Malkoc, M., D. Karadibak, and Y. Yldrm, *The effect of physiotherapy on ventilatory dependency and the length of stay in an intensive care unit.* International Journal of Rehabilitation Research, 2009. 32(1): p. 85-88.
[14] Paulus, F., et al., *Guideline implementation powered by feedback and education improves manual hyperinflation performance.* Nursing in critical care, 2016. 21(1): p. 36-43.
[15] Ortiz, T.d.A., et al., *Experimental study on the efficiency and safety of the manual hyperinflation maneuver as a secretion clearance technique.* Jornal Brasileiro de Pneumologia, 2013. 39(2): p. 205-213.
[16] Anderson, A., et al., *Effects of ventilator vs manual hyperinflation in adults receiving mechanical ventilation: a systematic review of randomised clinical trials.* Physiotherapy, 2015. 101(2): p. 103-110.
[17] Denehy, L. and S. Berney, *Physiotherapy in the intensive care unit.* Physical Therapy Reviews, 2006. 11(1): p. 49-56.
[18] Berney, S. and L. Denehy, *A comparison of the effects of manual and ventilator hyperinflation on static lung compliance and sputum production in intubated and ventilated intensive care patients.* Physiotherapy Research International, 2002. 7(2): p. 100-108.
[19] Paulus, F., et al., *Benefits and risks of manual hyperinflation in intubated and mechanically ventilated intensive care unit patients: a systematic review.* Critical Care, 2012. 16(4): p. R145.
[20] Bourgault, A.M., et al., *Effects of Endotracheal Tube Suctioning on Arterial Oxygen Tension and Heart Rate Variability.* Biological Research For Nursing, 2006. 7(4): p. 268-278.
[21] Faraji, A., et al., *Open and Closed Endotracheal Suctioning and Arterial Blood Gas Values: A Single-Blind Crossover Randomized Clinical Trial.* Critical Care Research and Practice, 2015. 2015: p. 7.
[22] E Sayed Ahmed, S., G. A Younis, and H. Al-Metyazidy, *Effect of Shallow versus Deep Endotracheal Tube Suctioning on Hemodynamic Parameters in mechanically ventilated patients in Intensive Care Unit*. 2018.
[23] Redfern, J., E. Ellis, and W. Holmes, *The use of a pressure manometer enhances student physiotherapists' performance during manual hyperinflation.* Australian Journal of Physiotherapy, 2001. 47(2): p. 121-131.

[24] Jones, A.M., P.J. Thomas, and J.D. Paratz, *Comparison of flow rates produced by two frequently used manual hyperinflation circuits: a benchtop study.* Heart & Lung, 2009. 38(6): p. 513-516.

[25] Hodgson, C., et al., *The Mapleson C circuit clears more secretions than the Laerdal circuit during manual hyperinflation in mechanically-ventilated patients: a randomised cross-over trial.* Australian Journal of Physiotherapy, 2007. 53(1): p. 3338.

[26] Pathmanathan, N., N. Beaumont, and A. Gratrix, *Respiratory physiotherapy in the critical care unit.* BJA Education, 2014. 15(1): p. 20-25.

[27] Kate Hayes BPhysio, M., D.S. BPhysio, and M.W. BPhysio, *Ventilator hyperinflation: a survey of current physiotherapy practice in Australia and New Zealand.* New Zealand Journal of Physiotherapy, 2011. 39(3): p. 124.

[28] Linnane, M.P., et al., *A comparison of the effects of manual hyperinflation and ventilator hyperinflation on restoring end-expiratory lung volume after endotracheal suctioning: A pilot physiologic study.* Journal of critical care, 2019. 49: p. 77-83.

[29] O'Donnell, K., *A survey of hyperinflation techniques in ICU based physiotherapists in the UK.* Physiotherapy, 2019. 105: p. e178.

[30] Freitas, D.A., et al., *Standard (head‐down tilt) versus modified (without head‐down tilt) postural drainage in infants and young children with cystic fibrosis.* Cochrane Database of Systematic Reviews, 2018(3).

[31] Guner, S.I. and F.D. Korkmaz, *Investigation of the effects of chest physiotherapy in different positions on the heart and the respiratory system after coronary artery bypass surgery.* Toxicology and industrial health, 2015. 31(7): p. 630-637.

[32] Girelli, D., *Respiratory Physiotherapy After Paediatric Cardiac Surgery: The Interaction between Physiotherapist, Nurse and Parent*, in *Congenital Heart Disease*. 2019, Springer. p. 149-162.

[33] Hodgson, C., S. Carrol, and L. Denehy, *A survey of manual hyperinflation in Australian hospitals.* Australian Journal of Physiotherapy, 1999. 45(3): p. 185-193.

[34] Paulus, F., et al., *Manual hyperinflation of intubated and mechanically ventilated patients in Dutch intensive care units—A survey into current practice and knowledge.* Intensive and Critical Care Nursing, 2009. 25(4): p. 199-207.

[35] Hodgson, C., et al., *An investigation of the early effects of manual lung hyperinflation in critically ill patients.* Anaesthesia and intensive care, 2000. 28(3): p. 255-261.

[36] Choi, J.S.-P. and A.Y.-M. Jones, *Effects of manual hyperinflation and suctioning on respiratory mechanics in mechanically ventilated patients with ventilator-associated pneumonia.* Australian Journal of Physiotherapy, 2005. 51(1): p. 25-30.

[37] Patman, S., S. Jenkins, and K. Stiller, *Manual hyperinflation—Effects on respiratory parameters.* Physiotherapy Research International, 2000. 5(3): p. 157-171.

[38] Barker, M. and S. Adams, *An evaluation of a single chest physiotherapy treatment on mechanically ventilated patients with acute lung injury.* Physiotherapy Research International, 2002. 7(3): p. 157-169.

[39] Blattner, C., J.C. Guaragna, and E. Saadi, *Oxygenation and static compliance is improved immediately after early manual hyperinflation following myocardial revascularisation: a randomised controlled trial.* Australian Journal of Physiotherapy, 2008. 54(3): p. 173-178.

[40] Maa, S.-H., et al., *Manual hyperinflation improves alveolar recruitment in difficult-towean patients.* Chest, 2005. 128(4): p. 2714-2721.

[41] Paulus, F., et al., *Manual hyperinflation partly prevents reductions of functional residual capacity in cardiac surgical patients-a randomized controlled trial.* Critical Care, 2011. 15(4): p. R187.

[42] Ahmed, F., et al., *Comparison of effects of manual versus ventilator hyperinflation on respiratory compliance and arterial blood gases in patients undergoing mitral valve replacement.* Heart & Lung, 2010. 39(5): p. 437-443.

[43] Dennis, D., W. Jacob, and C. Budgeon, *Ventilator versus manual hyperinflation in clearing sputum in ventilated intensive care unit patients.* Anaesthesia and Intensive Care, 2012. 40(1): p. 142-149.

[44] Al Mutairi, F. (2013). Alternative methods of treating atelectasis in post-operative patients.

[45] Martínez, T. M., Llapur, C. J., Williams, T. H., Coates, C., Gunderman, R., Cohen, M. D., ... & Tepper, R. S. (2005). High-resolution computed tomography imaging of airway disease in

infants with cystic fibrosis. American journal of respiratory and critical care medicine, 172(9), 1133-1138.

Influence of Gender and Religion on the Examination Stress of Secondary School Students in South Western Nigeria

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Abstract

Purpose: This study was therefore designed, using data of blood pressure, to understand the influence of religion and gender on the effect of examination stress on blood pressure of the secondary school students in South Western (SW) Nigeria.

Methodology: The population of the study comprises all the students of Oroke Grammar School, Akungba Akoko (650) out of which a sample of 351 that satisfied our criteria was selected, using purposive sampling technique. Digital sphygmomanometer was used to measure the actual blood pressure readings of the respondents twice on each occasion and with at least thirty minutes interval in sitting positions. The measurements were carried out three times during the study, two weeks after resumption for the second term of the 2017/2018 academic year, two weeks before the second term examination and two weeks after resumption for the third term.

Findings: In this work, a rule of thumb was used to connect the perceived stress (PS) and the % change in the systolic blood pressure (SBP) when a subject is stressed, as PS=100/(% change in SBP). The results show that the group of female students in the general population always feels more stressed than their male counterpart, and respectively in the Islam religion and in the Christian religion always feels more stressed than their respective male counterparts. Also the groups of male and the female students in the Islam religion always feel more stressed than their groups of male and female students in the Christian religion

Unique Contribution to Theory, Practice and Policy: Gender and religion were found to affect the level of perceived stress of the students. It was recommended that male students should be encouraged to go for regular blood pressure checkups as they are more likely not to feel stressed even when their blood pressure has increased much above the normal. This is one of the measurements the health personnel should do whenever a male student in particular is in the health centre. Because the number of Christian students in this work is much larger than the number of Muslim students, more research is needed with comparable number of students in each religious group to further understand how religious practices play a role in perceived stress of college students. Future research should include more variables that influence coping methods and parental influence and guidance.

Keywords: *Blood Pressure, Examination, Gender, Perceived Stress, Religion*

INTRODUCTION

Stress starts when the emotional, environmental, and physical needs of the individuals compete with one another, and exceed the ability the individual can cope with. It is expressed or felt by a student during his failure to cope with the academic demands, lectures and home works; and the consequence of this will lead to health hazards and problems that can be experienced as head ache, high blood pressure, allergies and other health experiences (Hammen, 2005; Krantz et al., 2013; O'Donovan et al., 2013).

Examination stress is caused by various stressors including, the fear of inadequate preparation for the exam and fear of failing it, the need to pass very well in the exam to satisfy the parental and guardian expectation, and the extra effort made to work harder by burning the midnight oil over the preparation for the examination. Stress can raise the blood pressure of a subject (Gasperin et al., 2009; Sharma, 2011; Unger & Parati, 2005), not necessarily above the normal pressure, and causing the mean blood pressure of a stressed group to be raised (Ajayi & Adegboro, 2020). This is because epinephrine (Adrenalin) and the cortisol hormones are secreted. The blood vessels tighten and the activity of the nervous system and the heart rate increase. As a result, blood pressure increases (Huang et al. 2013; Lovallo, 2010).

A number of environmental factors can change the level of the stress on the student, vis a vis the level to which stress raises the blood pressure. Some of these factors include the gender which the student belongs to, the social class in which the student is involved (Najafi, et al., 2018), the religious movement (Koenig, 2009; Lorenz et al., 2019), the family in which the student is raised and the parental occupation.

Perceived stress is the feeling or thought that an individual has about how much stress he or she is under at a given time or over a given period of time. Men show more stress than women, but the females perceive more stress in the interpersonal domain more than the males (Saxena et al., 2014; Tangade et al., 2011).

Although the importance of stress as a public health issue has been widely recognized, many early studies of stress failed to examine the effect of gender in their data analysis, and studies were often conducted with only male samples (Maranon & Reckelhoff, 2013; Paresh et al., 2019). Recent studies have begun to recognize the influence of gender on stress and have consistently revealed that women report higher levels of chronic and daily stress than men (Calvarese, 2015). In a research by Harshfiled et al. (2002) in which 151 boys

and 141 girls, between 15 to 18 years old, experienced 5 hours of stress (2 hours of pre-stress, 1 hour of stress and 2 hours of post-stress), the increase in the systolic blood pressure of the boys was higher during the research (P = 0.001). This increase is suggested to be caused by slow response of sodium secretion in boys' urine, which increases blood pressure and a possibility of secretion of estradiol in girls, which might delay and decrease the blood pressure. In a different research in which 190 girls between 8 and 16 years of age participated, it was reported that stress due to computer game increases blood pressure (Jagadheeswari et al., 2018). This increase was reported to be less in girls than in boys (Kavya, 2005).

Most of the above works are based on self- reported measurements using some stress scales which may not be completely free from bias, as the participants will often answer questions in a socially desirable manner to avoid the stigma associated with admitting personal inadequacies. It is therefore necessary to use unbiased method of measurement to assess the stress of subjects.

In Nigeria, there are three major religions: the Traditional religion where the followers are called the Traditionalists, Christianity where the followers are called Christians and Islam religion where the followers are called Muslims. Religion strongly influences how college students deal with daily normal stress. The religious active adults tend to have lower blood pressure than those who are less active. This also applies to attendance of religious services and private religious activities (Meng, et al., 2018; Meng et al., 2019; Sorenson, 2011). Cross sectional analysis has revealed consistent differences in the measured systolic blood pressure between frequent and infrequent religious service attenders. Lower blood pressure were observed among those who frequently prayed or studied the bible (Meng et al., 2018; Meng et al., 2019; Sorenson, 2011).

It has been found that religious activities, including prayers reduce stress, anxiety, depression and these results in the overall better mental health of followers (Behere et al., 2013; Carter, 2016). It was also found that prayer in religion also helps the individual to find meaning behind the stressor with an understanding that God is in control (Behere et al., 2013; Carter, 2016). Jafari (2011) stated that intrinsically religious people felt lower levels of stress and use problem focused coping to a higher degree as compared to extrinsically oriented people. Baqutayan (2011) revealed that religious orientation serves as a coping mechanism among the students in times of stress. Religious sources and skills (religiosity values, praying, and reading of Quran) are significantly

related to academic stress for students. Students with these skills are able to control academic stressors during their study at the university (Bataineh, 2013).

Record of the effects of the different religions on stress is scarce to find in the literature. In our present study therefore, both male and female students in different religions were exposed to the same stress of lectures and preparation for the terminal exam during the second term of the 2017/2018 school year. The percentage change in the systolic blood pressure from the beginning of the term to two weeks before the terminal exam was used to find the influence of gender and religion of the students on examination stress. This study was therefore designed to understand the influence of gender and religion on the effect of examination stress on the blood pressure of secondary school students in Oroke High School Akungba -Akoko, Ondo State, S.W. Nigeria.

METHODOLOGY

In carrying out this research, two instruments were used. The first instrument was a selfconstructed, structured, and closed ended questionnaire designed and built around the research questions to obtain the bio-data of the respondents, while the second instrument was the digital sphygmomanometer, used to monitor and record the actual systolic blood pressure (SBP) and diastolic blood pressure (DBP) readings of the respondents.

The readings were taken twice on each occasion with at least thirty minutes interval in sitting position. This was done three times during the study: two weeks into the second term of 2017/2018 academic session when students newly resumed from the New Year holidays, two weeks before the second term examination when all the students were seriously preparing for the second term examination, and two weeks after the resumption for the third term from a two week holidays, however readings taken two weeks after resumption for the third term were not used for this study. Data was analyzed with the use of Statistical Package for Social Sciences (SPSS) version 20.

Sampling Technique and Sample Size

Quasi experimental research design was used for this study. The population of the study comprised all the 650 students of Oroke Grammar School, Akungba Akoko. A sample of 351 respondents that satisfied our criteria for selection, using stratified sampling technique was used. Students had been distributed into different classes in the school before the study and effort was made not to

disrupt the natural distribution. Opportunistic sampling technique was used to select all available and willing respondents into this study.

The students used for this sample were those who did not work during the holidays and at home after the school period, making them to be relaxed and to have relatively normal blood pressure when they resumed school. For this group, their blood pressure was raised only by academic/examination stress. Their data of SBP at the beginning of the school term was therefore lower than their systolic blood pressure two weeks to the terminal examination. The respondents whose initial blood pressures were observed to be elevated at the beginning of the term were deliberately removed from the study population.

Grouping of Data

The secondary grammar school used for this study was situated in a town where there were many Christians, very few Moslems and a scanty number of believers in other respective religions. Therefore, only students in the Christian and Islam religions were used for this study. In order to find the influence of gender on the effect of examination stress on the blood pressure, the whole data was separated into two groups of male and female students irrespective of their religion. Similarly, in order to find the influence of religion on the effect of examination stress on blood pressure, each of these gender groups was separated into two sub-groups of students respectively in Christian and Islam religions. Because the number of students in other religions different from the above was statistically very few, their data were discarded when considering the influence of religion. The detail of the method of collection of data and of obtaining the sample size for this work is already given in a previous paper (Ajayi & Adegboro, 2020).

Statistical Analysis

Stress can raise the blood pressure of a subject **(**Gasperin et al., 2009; Sharma, 2011; Unger & Parati, 2005), not necessarily above the normal pressure, and causing the mean blood pressure of a stressed group to be raised. The analysis of this work therefore considered the mean % change in the blood pressure of a group of students between the beginning of the term when they were not stressed and two weeks to the terminal exam when they were stressed, to find the influence of the blood pressure modifier on the effect of examination stress on mean blood pressure of the group. The groups considered in this analysis were groups of the male and female students in the whole population, and also in the Christian and Muslim student population in the school. The data were arranged according to these groups to assess the mean blood pressure of the

group at the beginning of the term and two weeks to the terminal examination and also the mean % change in the blood pressure. The statistical software SPSS version 20.0 was used to calculate the mean and the standard deviation of the systolic blood pressure of each group when they resumed studies at the beginning of the second term and at two weeks to the second term examination, and also the mean % change in the SBP between the beginning of the term and two-weeks to second term exam. During the discussion of the results, a rule of thumb was initiated to relate the mean % change in the SBP to the level of perceived stress felt by the different groups.

FINDINGS

Table 1 shows the mean age; the mean systolic blood pressure of groups of selected male and female students in the school at two weeks after the beginning of the school term when they were not yet academically stressed and at two weeks to the terminal examination when they were stressed, and also the mean % change in the SBP of the two pressure values. The mean age of the respective male and female groups was about 14 years. The mean systolic blood pressure at two weeks to the examination was higher than its value at the beginning of the term for both groups of male and female students. The mean % change in the SBP between the beginning of the term and two weeks to the terminal examination of the female group of students was lower than that for the male group.

Table 1: The Mean Age, the Mean SBP at the Beginning of Term and at 2 Weeks before the Terminal Exam and also the Mean % Change in SBP in That Interval for the Male and Female Student Groups, in the Second Term of 2017/2018 School Year

Gender	No of students	Mean age (years)	Mean SBP±SD (mmHg)		Mean % change in SBP
			Beginning of term	2wks to exam	
Male	144	13.6±1.9	98.6±11.9	108.9±10.4	11.2±10.7
Female	207	13.3±1.8	102.1±11.3	111.2±11.9	9.4±10.5

Table 2: The Mean Age, the Mean SBP at the Beginning of Term and at 2 Weeks before the Terminal Exam and also the % Change in SBP in that Interval in the Second Term of 2017/2018 School Year for Groups of Male and Female Students in Different Religions

Religion	MALE STUDENTS					FEMALE STUDENTS				
	No of Students	Mean Age (Yrs)	Mean SBP±SD (mmHg)		Mean % Change In SBP	No of Students	Mean Age (Yrs)	Mean SBP±SD (mmHg)		Mean % Change in SBP
			Beginning of Term	2wks to Exam				Beginning of Term	2wks To Exam	
Christianity	132	13.5 ±1.8	98.8 ±12.3	109.1 ±10.6	11.2 ±11.0	185	13.3 ±1.8	101.8 ±11.5	111.3 ±10.2	9.8 ±8.5
Islam	10	13.5 ±2.6	95.2 ±5.5	103.5 ±5.6	8.8 ±4.8	12	14.0 ±1.9	104.6 ±6.0	110.8 ±6.8	6.0 ±4.2

It may be seen in Table 2 that the mean systolic blood pressure at two weeks to the terminal examination is generally higher than its value at the beginning of the term for both the male and female groups of students respectively in Christianity and in Islam. However, the mean % change in the SBP of the male group of students is higher than that of the female group in each religion and the mean % change in the SBP of the respective male and female groups of Christian students is higher than that of their counterparts in Islam.

Discussion

The mean % change in the SBP is as a result of the stress on each group and the level to which the modifiers affect the mean SBP of the groups. Because all the groups are subjected to the same teaching and exam stress, one would have expected that the mean % change in the SBP of all the groups will be equal. However, because of the different effects of the modifiers on them, the mean % change in the SBP will differ from one group to the other, becoming smaller as the modifying effect is becoming larger and vice versa. It may be seen in Table 1 and Table 2 that the modifying effect of the male gender on the mean % change in SBP is smaller than that of the female gender, and the modifying effect of the Christian religion is smaller than that of Islam religion, and respectively for both the male and female groups.

Since stress causes a surge of hormones which raises the blood pressure (Gasperin et al., 2009; Sharma, 2011; Unger & Parati, 2005), it is expected that the higher the blood pressure increases, the greater the stress will become. However, the hormones in the male and female subjects are not totally the same (Ajayi & Adegboro, 2020). One of the most important hormones released is cortisol, in response to which the body produces other hormones to

counteract its effect (Hamer & Steptoe, 2012; Kelly, 2005; Khoshemehry et al., 2014).

Both the males and females produce oxytocin which is known to calm down the body and induce relaxation. The females produce more oxytocin than the males, making them to feel tired earlier than their male counterpart, while the males in addition produce vasopressin which is known to promote the sense of taking risk (Ajayi & Adegboro, 2020), and making them not to feel stressed even when their systolic blood pressure continues to rise. Thus the females experience a perceived stress earlier than their male counterpart (Dusselier et al., 2005; Eun-Jun, 2009; Shah et al., 2010), resulting in an inverse relation between the mean % change in SBP and perceived stress. This inverse relationship was somehow corroborated by the works of Suter et al. (1997) and Sparrenberger (2009) who found an inverse relation between perceived stress and SBP, though the relationship was not stated.

For the convenience of correlating our data of blood pressure measurements with those of the previous workers who used the instrument of self-report perceived stress assessment questionnaires to obtain perceived stress in an interval, a simple rule of the thumb can meanwhile be introduced to estimate the perceived stress in the interval as the inverse of the mean % change in SBP in that interval. The level of Perceived stress is therefore written as PS = 100/ (mean % change in SBP in the interval). Table 3.0 is constructed using the perceived stress for each group.

Table 3: Perceived Stress of Each Group due to the Influence of Different Modifying Factors

Blood Pressure Modifiers	MALE				FEMALE			
	N	Mean Age (Yrs)	Mean % Change in SBP	Mean Perceived Stress	N	Mean Age (Yrs)	Mean % Change in SBP	Mean Perceived Stress
Christianity	132	13.5±1.4	11.2±10.0	8.9±7.9	185	13.3±1.8	9.8±8.5	10.2±8.8
Islam	10	13.3±2.6	8.8±4.8	11.4±6.2	12	14.0±1.9	6.0±4.2	16.7±11.7
Whole Population	144	13.6±1.9	11.2±10.7	8.9±8.5	207	13.3±1.6	9.4±10.5	10.6±11.9

Perceived stress = 100/(mean % change in the SBP)

Tables 1 and 2 show that when the male and female secondary school students are subjected to the same teaching and exam workload, the mean change in the SBP, vis a vis, the mean % change in the mean SBP of the male group is higher than that for female group. When the value of the mean % change in the SBP is converted into perceived stress shown in Table 3.0, by using the simple rule

of the thumb, it is found that the level of perceived stress of the group of female students in the whole population is higher than that of their male counterpart and the level of perceived stress of the group of students in Islam religion is higher than that of the group in Christian religion, respectively for the male and female groups. This observation may be explained with the mode of practice in the different religions.

The higher level of perceived stress in female students than in male students may be contributed by the effect of the hormones, their emotional stress and the extra stress they endure at home. In Nigeria, girls normally participate with their mothers in carrying out domestic chores more than their male counterparts who are left free and rarely do anything, making the females more stressed at home than the males. This reason may stand for the female students at Oroke High school which is a day school and students always go back home after the school hours. In addition, females are more emotional than the males (Brody & Hall, 2008; Chaplin & Aldao, 2013), thus giving them higher emotional stress.

CONCLUSION AND RECOMMENDATIONS

Conclusions

This study adds to the body of knowledge concerning the influence of gender and religion on the effect of examination stress on the blood pressure of secondary school students. The study finds that there is a % change in the SBP of the group of students from the beginning of the term to two weeks before the terminal examination. The mean % change in the SBP of the group of male students respectively in the whole school population, in Islam religion and in the Christian religion is higher than that of the group of female students, showing that the % change in the SBP is dependent on gender and the type of religion of the students.

When the mean % change in the SBP is converted to perceived stress, the groups of female students respectively in the whole school population, in the Islam religion and in the Christian religion are found to feel more stressed than their male counterparts. Also the group of male students in the Islam religion will feel more stressed than their male counterpart in the Christian religion, and similarly for the groups of female students.

The gender differences are in general associated with the differences of hormones in the males and the females, the higher emotional stress in the females and the extra daily work stress the females endure at home, while the

religion-differences may be associated with the mode of practice in those religions.

Recommendations

Male students should be educated and encouraged to always go for regular blood pressure checkups as they are likely not to feel stressed even when their blood pressure has greatly increased. Health personnel should always suspect and check the blood pressure of the male students when they do not even verbalize or complain of the stress they are going through like their female counterparts.

Because the number of Christian students in this work is very much larger than the number of Muslim students, our result may be inconclusive and more research is therefore needed using comparably equal number of students in the different religious groups to further understand how religious practices play their roll on perceived stress of college students. Future research should include more variables that influence coping methods and parental influence or guidance.

Emerging Issues and Controversies

According to Panjwani et al (2016), research has shown that there can be gender disparities in how examination stress is experienced and expressed. Female students, in some cases, may report higher levels of stress due to factors such as societal expectations, self-imposed pressure, and gender discrimination. Also, the extent and causes of these gender disparities in examination stress are still debated. Some argue that traditional gender roles and societal expectations play a significant role, while others believe that individual differences and personality traits are more influential.

Secondly, many students in South Western Nigeria turn to their religious beliefs and practices as a coping mechanism for examination stress (Aderinto, (2000). Religious faith can provide emotional support and a sense of purpose during stressful times. Also, the controversy lies in whether the reliance on religion as a coping mechanism is healthy or if it might lead to avoidance of effective problem-solving strategies. Some argue that excessive reliance on religion may hinder academic performance if students do not also employ effective study techniques.

Finally, South Western Nigeria is known for its diverse cultures and religious practices (Eze-Uzomaka and Oloidi, 2017), Different ethnic groups and religious affiliations may have varying approaches to education and examination stress. Also, the controversy centers around how to respect and accommodate this diversity in educational settings. Balancing the need for a standardized educational system with cultural and religious sensitivities can be challenging.

Understanding and addressing these emerging issues and controversies is essential for creating a more inclusive and supportive educational environment for secondary school students in South Western Nigeria. It requires a nuanced approach that respects cultural and religious diversity while also prioritizing the mental and emotional well-being of students.

REFERENCES

Aderinto, A. A. (2000). Social correlates and coping measures of street-children: a comparative study of street and non-street children in south-western Nigeria. Child abuse & neglect, 24(9), 1199-1213.

Ajayi, N. O., & Adegboro, J. S. (2020). Effect of examination stress on the blood pressure of secondary school students in Oroke High School, Akungba-Akoko, Ondo State, South Western Nigeria. European Journal of Medical and Health Sciences, 2 (3), 1- 6.

Baqutayan, S. M. S. (2011). The importance of Religious orientation in managing stress. International Journal of Psychological Studies, 3 (1), 113-121.

Bataineh, M. Z. (2013). Academic Stress among undergraduate students: The case of Education Faculty at King Saud University. International Interdisciplinary Journal of Education, 2 (1), 82-88.

Brody, L.R., & Hall, J. A. (2008). Gender and emotion in context. In: Lewis M., Haviland-Jones

Calvarese, M. (2015). The effect of gender on stress factors. An exploratory study among University students. Soc. Sci., 4, 1177- 1184.

Carter, B. N. (2016). Associations of religious commitment and perceived stress levels in college students. University Honors Program Theses. 183. Georgia Southern University, USA. https://digitalcommons.georgiasouthern.edu/honors-theses/183.

Chaplin, T, M., & Aldao, A. (2013). Gender differences in emotion expression in children; A meta-analytic review. Psychological Bulletin, 139, 735-765.

Dusselier, L., Dunn, B., Wang, Y., Shelley, M. C. II., & Whalen, D. F. (2005). Personal Health, academic and environmental predictors of stress for residence hall students. Journal of American College Health, 54 (1), 15-24.

Eun-Jun, B. (2009). The effect of gender, Academic concerns and social support on stress for international students. PhD Thesis, University of Columbia.

Gaasperin, D., Netuveli, G., Dias-da-Costa, J. S., & Pattussi, M. P. (2009). Effect of psychological stress on blood pressure increase: a meta-analysis of cohort studies. Cash Saude Publica, Rio de Janeiro, 25 (4), 715-726.

Hamer, M., & Steptoe, A. (2012). Cortisol responses to mental stress and incident hypertension in healthy men and women. The Journal of Clinical endocrinology and metabolism, 97 (1), 29-34.

Hammen, C. (2005). Stress and depression. Annu. Rev, Clin. Psychology, 1, 203-319.

Harshfiled, G. A., Treiber, F. A., Davis, H., & Kapuku, G. K. (2002). Impaired stress-induced pressure natriuresis is related to left ventricle structure in blacks. Hypertension, 39, 844847.

Huang, C., Webb, H, .E., Zourdis, M, C., & Acevedo, E. O. (2013). Cardiovascular reactivity, stress and physical activity. Frontiers in Physiology, 4, 314.

J. M., Barrett L.F., editors. Handbook of emotion, 3rd Edition. The Giuldford Press, New York, N. Y. 395-408.

Jafari, A. (2011). Relationship between religious orientation (internal-external) with methods of overcoming stress in students of Islamic Azad University of Abhar. Psychology Research, 1(4), 239-243.

Jagadheeswari, R., Devi, R. G., & Priya, A. J. (2018). Evaluating the effects of video games on blood pressure and heart rate. Drug Invention Today, 10 (1), 2702-2704.

Kavya, V. (2005). Young as a Moderator on the effects of stress on Hypertension. Research Journal for the Human Sciences, 4, 998-1006.

Kelly, J. J. (2005). Cardiovascular consequences of cortisol excess. Vasc. Health Risk Manag.,1 (4), 291-299.

Khoshemehry, S., Khanmohammadi, A., & Bahram, M. E. (2014). The effect of stress on blood pressure and heart rate of High School girls. Int. Journ. of Sport studies, 4 (4), 448-451.

Koenig, H. G. (2009). Research on religion, spirituality, and mental health: A review. Can. J. Psychiatry, 54, 285-291.

Krantz, D., Thorn, B., & Kiecolt-Glaser, J. (2013). How stress affects your health. Retrieved from https://www.apa.org/helpcenter/stress-facts.pdf

Lorenz, L., Doherty, A., & Casey, P. (2019). The role of religion in buffering the impact of stressful life events on depressive symptoms in patients with depressive episodes or adjustment disorder. Int. J. Environ Res Public Health, 16 (7), 1238.

Lovallo, W. R. (2010). Cardiovascular responses to stress and disease outcomes. Hypertension, 55, 842-843.

Maranon, R., & Reckelhoff, J. F. (2013). Sex and gender differences in control of blood pressure. Clin. Sci. (Lond), 125 (7), 311-318.

Meng, Q., Xu, Y., Shi, R., Zhang, X., Wang, S., Liu, K., & Chen, X. (2018). Effect of religion on hypertension in adult Buddhists and residents in China: A cross-sectional study. Sci, Rep., 8:8203. doi:10.1038/s41598-018-26638-4.

Meng, Q., Zhang, X., Shi, R., Liao, H., & Chen, X. (2019). Correlation between religion and hypertension. Intern. Emerg. Med., 14,209-237.

Najafi, N., Movahed, K., Barzegar, Z., & Samani, S. (2018). Environmental factors affecting students' stress in the educational environment: A case study of Shiraz schools. Int. J. School Health, 5 (2), e67153, 1-7.

O'Donovan, R., Doody, O., & Lyons, R. (20013). The effect of stress on health and its implications for nursing. British Journal of Nursing, 22 (16), 969-973.

Panjwani, N., Chaplin, T. M., Sinha, R., & Mayes, L. C. (2016). Gender differences in emotion expression in low-income adolescents under stress. Journal of Nonverbal Behavior, 40, 117-132.

Paresh, S. S., Greco, T. L., & Rohr-Kirchgraber, T. (2019). The sex and gender influence on hypertension. Health Management, 19 (5), 420-422.

Saxena, Y., Shrivastava, A., & Snighi, P. (2014). Gender correlation of stress levels and sources of stress among first year students in a medical college. Indian Journal of Philosophy and Pharmacology, 58, 147-151.

Shah, M,, Hasan, S., Malik, S., & Sreemareddy, C. T. (2010). Perceived stress sources and the severity of stress among medical undergraduates in a Pakistani Medical school. BMC Medical Education, 10 (2), 1-8.

Sharma, B. (2011). A study of academic stress and its effect on vital parameters in final year medical students at SAIMS Medical College, Indore, Madhya Pradesh. Biomedical Research, 22 (3), 361-365.

Sorenson, T., Danbolt, L. J., Lien, L., Koenig, H. G. & Holman, J. (2011). The relationship between religious attendance and blood pressure: The Hunt study, Norway. The Internationa Journal of Psychiatry in Medicin., https://10.2190/pm.42.1.6.

Sparrenberger, F., Cichelero, F. T., Ascoli, A. M., Fonseca, F. P., Weiss, G., Berwanger, O., Fuchs, S. C., Moreira, L. B. & Fuchs, F. D. (2009). Does psychosocial stress cause hypertension? A systematic review of observational studies. Journal of Human Hypertension, 23, 12-19.

Suter, P. M., Maire, R., Hold, D., & Veter, W. (1997). Relationship between self perceived stress and blood pressure. Journal of Human Hypertension, 11, 171-176.

Tangade, P. S., Mathur A., Gupta, R., & Chaudhary, S. (2011). Assessment of stress level among dental school students: An Indian outlook. Dental Research Journal, 8, 95-101.

Unger, T. & Parati, G. (2005). Acute stress and long lasting blood pressure elevation: a possible cause of established hypertension. Journal of Hypertension, 23, 261-263.

Whitworth, J. A., Williamson, P. M., Mangos, G. & Kelly, J. J. (2005). Cardiovascular consequencies of cortisol excess. Vaqsc. Health Risk Management, 1 (4), 291-299.