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AWARENESS, KNOWLEDGE AND PREVALENCE OF HYPERTENSION, SLEEP APNEA AND SLEEP - DISORDERED BREATHING DIFFICULTIES IN MALES AMONG CHENNAI POPULATION

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ABSTRACT

Hypertension, sleep apnea and sleep disordered breathing are the important Global public health challenges the world is facing nowadays with the highest prevalence rate all over the world. Recently a large body of work has been going on in finding the association of sleep- disordered breathing, sleep Apnea and Hypertension in the Male population.The aim of this study is to determine the association of sleep- disordered breathing, sleep Apnea and Hypertension in the young, Adult and aged Male population.Standard survey questions based on sleep disordered breathing, sleep apnea and hypertension were designed and was uploaded in an online survey platform and circulated among the males. A total of 100 responses were collected and were statistically analysed. In this study we observed that there is an association of sleep disordered breathing, sleep apnea with hypertension ($p<0.001$, independent sample t-test).Since there were no previous studies to encounter this association in India. This study serves as an eye opener for the early diagnosis and treatment of sleep disordered breathing, sleep apnea and hypertension in the young, Adult and aged Male population. This study will be beneficial in the awareness of health care professionals to consider the evaluation of patients with hypertension, sleep apnea and sleep disordered breathing.

KEY WORDS: apnea, association, gasping, hypertension, males, sleep breathing.

INTRODUCTION

Hypertension, sleep apnea and sleep disordered breathing are important Global public health challenges the world is facing nowadays. (Nieto and Javier Nieto, 2000) Sleep apnea is increasingly being recognised as a major health burden with the strong focus on the associated cardiovascular risk. Apnea is characterised by the recurrent periods of complete/ partial collapse of the upper airway during sleep causing sleep fragmentation and frequent awakenings which often result in excessive daytime sleepiness. In more severe forms of apnea, periods of obstructed breathing result in profound intermittent hypoxia, increase in heart rate and blood pressure. Generally the adult with sleep disordered breathing and apnea are typically centrally obese, and although this obesity is strongly centrally linked to the condition, there is an increased prevalence of cardiovascular morbidity and mortality among OSA, sleep disordered breathing sufferers. (Guilleminault, Tilkian and Dement, 1976; Tilkian et al., 1977; Strollo and Rogers, 1996; ‘Cardiovascular Morbidity and Obstructive Sleep Apnea’, 2014)

In healthy individuals, sleep is associated with a 10-15% reduction in systolic and diastolic BP compared to wakefulness. This phenomenon is referred to as BP dipping. (Suzuki et al., 1996; Chang et al., 2015) The major risk factors for sleep apnea are obesity, Male sex and advancing stage. Since the conditions often predispose to and are coincident with hypertension it can explain the etiological association of both. ((Westbrook et al., 2005) The pathophysiology of hypertension in apnea, sleep disordered breathing is complex and is dependent on various factors such as sympathetic tone, peripheral vasoconstriction, increased renin-angiotensin-aldosterone activity and altered baroreceptor reflexes. The intermittent apneic episodes cause hypoxemia which stimulates the carotid body chemoreceptors, causing reflex sympathetic stimulation of the medullary cardiorespiratory centres. The nocturnal catecholamine surges cause a resultant nocturnal increase in the heart rate and blood pressure that is the most prominent during the post apneic hyperventilation soaring as high as 240/130 mm/Hg. This nocturnal BP surge of manifests in many failures of the normally observed dipping phenomenon and in other cases precipitates. Or simply we can say when the sleep is disrupted by either sleep apnea/ sleep disordered breathing, it leads to potential threatening of life, since it can lead to hypertension and can cause complications like cardiovascular events such as coronary vasospasm, angina and arrhythmias.(Silverberg, 1997; Silverberg and Oksenberg, 2001)

In another study the pathophysiology is explained by the low oxygen level which is created by the sleep apnea and sleep disordered breathing triggers the receptors in our brain as a result of which the brain sends a message to the blood vessels to increase the available oxygen to the heart and brain so that the body can keep functioning. This increase in blood flow puts pressure on the blood vessel walls, elevating levels to higher than normal. For this reason, if apnea/ sleep disordered breathing, your risk of high blood pressure is greater. In its most severe form, this condition can increase the risk of heart disease and stroke.(Mayer and Peter, 1992; Silverberg, 1998; Lavie et al., 2001) On the other hand, Acute BP surges have been shown to increase the upper airway obstruction which is reported by many studies that the rise in BP resulted in lower genioglossus electromyographic activity. The genioglossus being an extrinsic muscle of the human tongue plays a crucial role in preserving airway patency. In the last quarter century, more than fifty studies have reported that the genioglossus electromyographic activity has increased during the night hours which adds up a reason for this study to be conducted.(Carrera et al., 1999) As we know there is male predilection as seen in hypertension, sleep apnea and sleep disordered breathing, this study is conducted only among the males. The reason for the heightened Male predominance remains nebulous but could allegedly be explained by factors such as fat distribution, upper airway anatomy, craniofacial configuration and hormonal variations across genders. (Rema et al., 2000)

Various treatment modalities have been employed for hypertension, apnea and sleep disordered breathing individually. Continuous Positive Airway Pressure (CPAP) therapy has been observed to attenuate the nocturnal sympathetic surge and mediate acute reduction in nocturnal BP in sleep apnea and sleep disordered breathing. However Hypertension due to its multifactorial nature shows variable effects to CPAP therapy. (Carrera et al., 1999; Kuźniar and Klinger, 2014) Another major risk factor for all of these conditions in common is obesity, even modest reductions in weight helps to attenuate the severity of both sleep apnea and apnea induced hypertension. Since both apnea and obesity have an individual casual relationship with hypertension, an integrated approach that includes lifestyle modifications such as weight loss should also be recommended in sleep apnea and sleep disordered breathing patients receiving treatment receiving treatment with CPAP and antihypertensives. (Sharma et al., 2007; Gay and Brown, 2009) Oral appliances are also recommended as an alternative treatment to CPAP in patients with mild to moderate apnea. (Gotsopoulos, Kelly and Cistulli, 2004; Naismith et al., 2005; Benoist et al., 2017) On the other hand, hypertensive patients with mild to moderate sleep apnea who do not need CPAP are ideal candidates for hypertensive therapy, as are those with severe apnea who do not tolerate / are not compliant with CPAP. Due to lack of adequate evidence, there are no specific guidelines as to which class of antihypertensive medications should be used to treat hypertension in sleep apnea patients.Hypothetically however, owing to the pathophysiological mechanisms causing hypertension in sleep apnea, anti hypertensive drugs that modulate the activity of these systems such as Beta blockers and aldosterone antagonists may be the best treatment options for hypertension in sleep apnea patients. ((Kasiakogias et al., 2015) Surgical options such as tonsillectomy and uvulopalatopharyngoplasty have also been looked at for impact of blood pressure in patients with apnea. (Padma, Ramakrishnan and Narayanan, 2007; Sunitha and Kumar, 2010; Zou et al., 2017)

Previously we conducted many bioinformatics studies (Sekar et al., 2019; Johnson et al., 2020) , morphological and morphometrical studies (Hafeez and Thenmozhi, 2016; Keerthana and Thenmozhi, 2016; Krishna, Nivesh Krishna and Yuvaraj Babu, 2016; Pratha, Ashwatha Pratha and Thenmozhi, 2016; Subashri and Thenmozhi, 2016; Nandhini et al., 2018) , Surveys (Samuel and Thenmozhi, 2015), online survey analysis (Sriram, Thenmozhi and Yuvaraj, 2015; Thejeswar and Thenmozhi, 2015), morphometrical studies (Choudhari and Thenmozhi, 2016;
Kannan and Thenmozhi, 2016), in vivo animal experimental studies (Seppan et al., 2018) and various review studies (Menon and Thenmozhi, 2016) in various fields of research. With all those studies done now we are concentrating on epidemiological survey based studies. We undertook this study to investigate the overall prevalence of Apnea, hypertension in human life and where it affects so that a complete therapy can be planned addressing the specific needs of the patient. Any treatment modality chosen on the basis of derangements in the physiological parameters only is unlikely to be complete as these parameters may not be the true representative of the extent of sufferings of the apnea and hypertension patients. Thus, there is a need for a complete holistic treatment considering physiological, emotional, and social impairment of the individual patient.

The previously conducted research studies fail to provide the correlation between their association with age and also they showed variable results. This variability in results has been attributed to the heterogeneity of enrolled patients in relation to cross-cultural and regional differences.Thus, the conclusions drawn from researches done outside India cannot be used to gauge the prevalence and association of it. With this background in mind, this study strives to fulfill this lacunae created by previous studies and aims to find the association of sleep- disordered breathing, sleep Apnea and Hypertension in the young, Adult and aged Male population.

MATERIALS AND METHODS:

An online survey based study was conducted among the young adults and aged Male population. Standard survey questions based on sleep disordered breathing, sleep apnea and hypertension prevalence was uploaded on an online survey platform (Google forms) and was circulated among the young, adult and aged Male population. All the Male participants were included in the study and their demographic and clinical data: age, occupation, history of hypertension, history of underbreathing/ non-breathing, medications if taken, gasping/ choking experience, frequency of it, awareness about the risk factors of hypertension, sleep apnea and disordered breathing were assessed and data was retrieved from the survey platform. 100 responses were collected and were transferred to the excel sheet and analysed subsequently using the statistical software SPSS. Our study minimised sampling bias by including all available data with no sorting process. Frequency and percentage were calculated for the study variable. The analysis was carried out using the independent sample t test and for correlation Chi-square test was done. The results were interpreted from the data collected.

RESULT AND DISCUSSION

A total of 100 responses were observed of which 76% belonged to the age group of 30-65 years (16% belonged to the age group of 15-30 years and 8% belonged to the age group of above 65 years (figure 1). Of the 100 people who participated in the study, stressful life was led by a statistically significant number of 83% participants (figure 2); 60% of the participants in the study suffered from hypertension and 74% (figure 3), 74% participants of the study suffered from hypopnea/ apnea during night hours(figure 5); 77% participants suffered from gasping, choking((figure 5). The frequency of the above mentioned disorders ranged from 38% (rarely) to 16% (frequently)(figure 6). Of the 100 participants, 63% (figure 7) have consulted a physician regarding hypertension, sleep apnea and sleep disordered breathing. About half the participants in the study attributed hypertension and sleep apnea as a preventable risk factor and was aware of it to the maximum limit (figure 8). Figures 9,10,11 and 12 shows the correlation of which figure 9, figure 10, figure 12 shows that they are statistically significant ($p<0.001$).

The prevalence of hypertension is 60% in our study. Over the years, many cross-sectional studies have confirmed the same prevalence rate. Similar findings were seen in the study conducted by Tripathy et al., who said that the most of the Indian males are substantially becoming significant. Few previously conducted prospective studies have directly investigated sleep disordered breathing as an independent risk factor for the future development of hypertension in the general population.(Ali and Feroz, no date a, no date b; Young, Peppard and Gottlieb, 2002; Zafar et al., 2019) In a cohort study of 709 working, middle-age males in Wisconsin, Peppard and colleagues observed that the risk of developing hypertension over 4 years increased with the degree of sleep disordered breathing at baseline. (Gupta et al., 2003, 2018; Hedner, 2006) However another study conducted by Subramaniam et al., proposes that the females are more hypertensive than males in India, the reason being increasing workload and stress among the women in India.(Gupta et al., 1995; Gupta, Sharma and Prakash, 2000) However the overall consensus of studies agree with the findings of our current study.

The prevalence of hypopnea / apnea during night hours is 74%. Similar findings were seen in the study conducted by Durani et al., who proposed that hypopnea, apnea are strongly linked to hypertension.(Durán-Cantolla et al., 2009) However opposing findings were seen in the study conducted by Robinson, who said that there is no association of hypopnea, apnea and hypertension, the reason being the errors which resulted from the limited validity of self reported snoring information. (Robinson, 2004)

Gasping / choking during night hours is a classical sign of sleep apnea and sleep disordered breathing. However, men who are thin, can still develop gasping / choking due to small airways, or enlarged tonsils. Other signs of sleep apnea include:Headaches in the morning, Waking up with a dry mouth or sore throat, Difficulty in learning or concentrating during the day, Waking up frequently in the night to urinate. (Myers, Mrkobrada and Simel, 2013) A researcher reported that a lot of times these symptoms are reported by the spouse in most of the cases. (Virkkula et al., 2005) In our study the prevalence rate of choking / gasping is

77% . Similar findings were seen in the study conducted by Rowley et al., who proposed that gasping / choking is an associated disorder of sleep apnea - hypertension. (Flemons et al., 1994; Rowley, Aboussouan and Safwan Badr, 2000) Olafiranye O et al., on the other hand, reported that gasping/ choking is not only associated with sleep apnea, but can also be a sign of cardiac arrest and other cardiovascular risks.(Olafiranye et al., 2013)

The drawback of this study is the reduced sample size , however this can be overcome by studying an even larger population in future. This study will shed light for future studies that investigate the association of sleep apnea and hypertension which inturn is useful for physicians. More prospective studies can be conducted to clarify the association.

CONCLUSION

Thus in this study we observed that there is an association of sleep disordered breathing, sleep apnea with hypertension. Hence apnea and Hypertension both need prompt diagnosis and treatment to help address the growing cardiovascular morbidity and mortality due to these two entities. Continued advancements in the field of medicine may lead to newer treatment modalities in the future.

AUTHOR CONTRIBUTIONS

The first author contributed for the conception of the study, carried out the survey by collecting the data, acquisition of data and drafting the manuscript after performing the necessary statistical analysis.

The second author contributed for guidance, supervision, aided in study design and revising it critically for important intellectual content.

The third author made formatting and other alignment corrections and contributed in the final approval of the submitted version of the manuscript.

CONFLICT OF INTEREST

None Declared.

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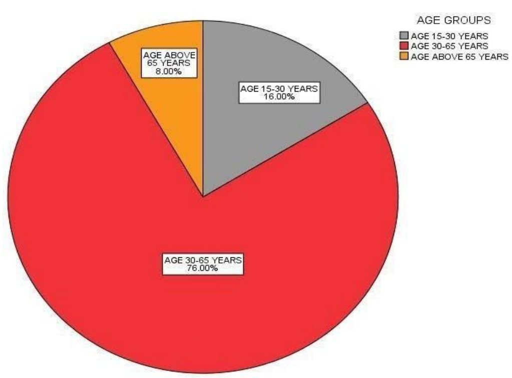

Figure 1 showing the percentage distribution of different age groups of males participated in the study. X-axis shows the age groups and Y-axis shows the percentage of responses: Age 15-30 years were 16% (Grey colour) ; Age 30-65 years were 76% (Red colour); Age above 65 years were 8% (Orange colour). This shows that the majority of participants (76%) in the study belonged to the age group of 30-65 years.

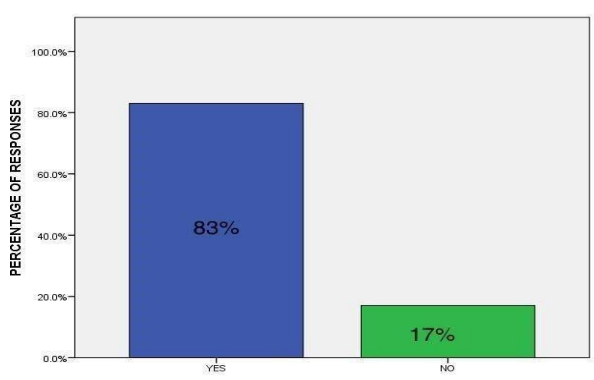

Figure 2: Bar graph showing the percentage distribution of stressful life due to sleep disorders among the participants. X-axis shows the stressful life and Y-axis shows the percentage of responses. 83% responded Yes (Blue colour); 17% responded No (Green colour). This indicates that the majority of the participants (83%) in the study had stressful lives due to sleep related disorders.

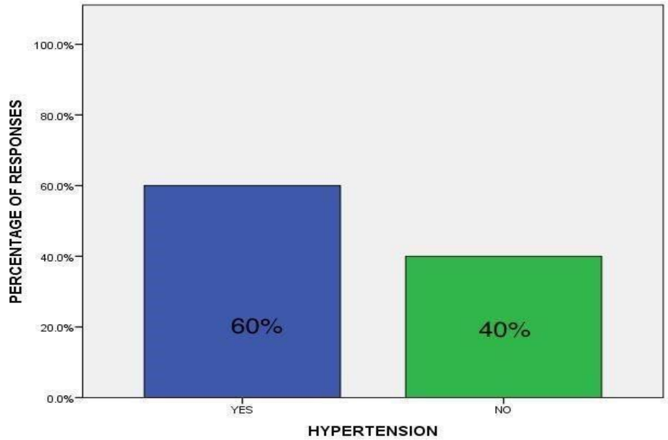

Figure 3: Bar graph showing percentage distribution of prevalence of hypertension among the participants. X-axis shows prevalence of hypertension and Y-axis shows the percentage of responses. 60% responded Yes (Blue colour); 40 % responded No (Green colour). This shows that 60% of the participants in the study were hypertensive.

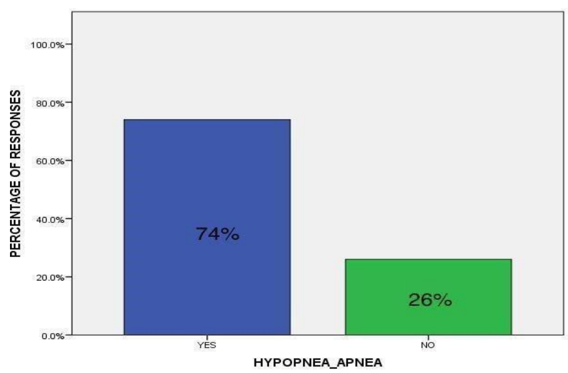

Figure 4: Bar graph showing the percentage distribution of prevalence of hypopnea and apnea among the participants. X-axis shows the hypopnea and apnea prevalence and Y-axis shows the percentage of responses. 74% responded Yes (Blue colour); 26% responded No (Green colour), showing that the majority of the participants (74%) suffered from episodes of hypopnea and apnea during night hours.

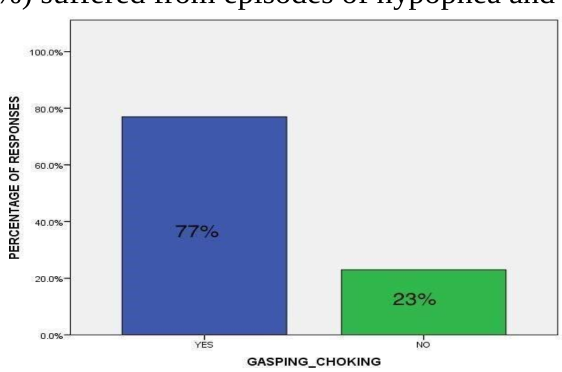

Figure 5: Bar graph showing the percentage distribution of the prevalence of gasping/choking during night hours among the participants. X-axis shows the gasping/choking difficulties among the participants and Y-

axis shows the percentage of responses. 77% responded Yes (Blue colour); 23% responded No (Green colour). This indicates that the majority of the participants (77%) suffered from gasping/choking difficulties during night hours while sleeping.

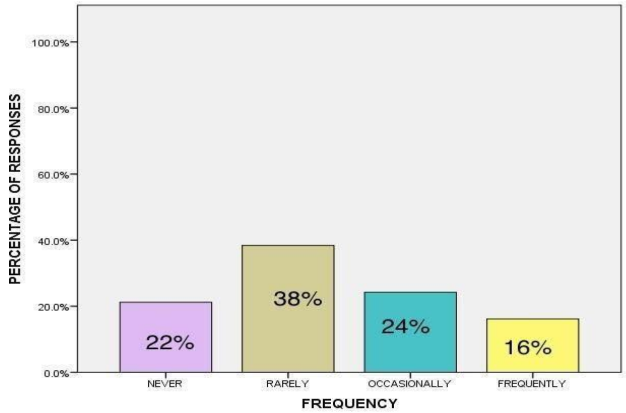

Figure 6: Bar graph showing the percentage distribution of frequency of getting hypertension, sleep apnea in their daily life. X-axis represents the frequency of getting hypertension and sleep apnea and Y-axis represents the percentage of responses. 22% never had hypertension and sleep apnea, 38% had rarely, 24% had occasionally and 16% felt that they suffered frequently from hypertension and sleep apnea. This indicates that among all the responses comparatively more number of participants (38%) rarely suffered from hypertension and sleep apnea in their daily life.

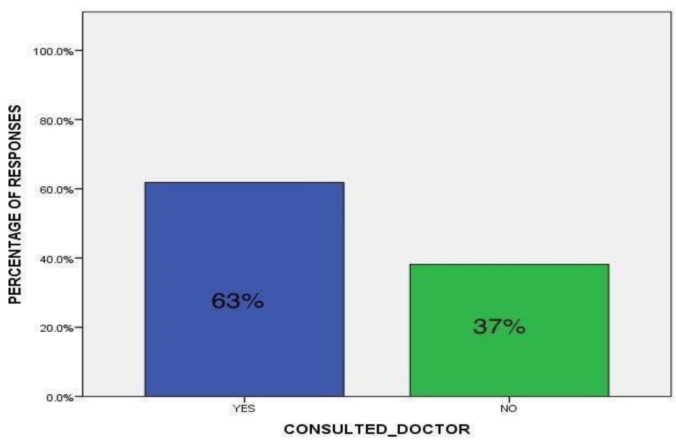

Figure 7: Bar graph showing the percentage distribution of the number of participants who had consulted a Doctor for hypertension or sleep apnea. X-axis shows the consultation with the Doctor and Y-axis shows the percentage of responses. 63% responded Yes (Blue colour), 37% responded No (Green colour). This indicates that the majority of the participants (63%) had consulted a Doctor for hypertension or sleep apnea.

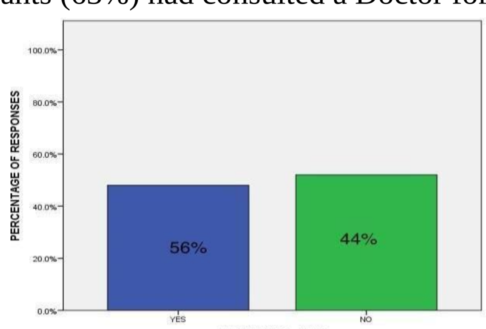

Figure 8: Bar chart showing percentage distribution of awareness of the risk factors of hypertension, sleep apnea and sleep disordered breathing difficulties among the participants. X-axis shows the awareness on the risk factors and Y-axis shows the percentage of responses. 56% responded Yes (Blue colour); 44% responded No (Green colour). This indicates that more number of participants (56%) in this study were aware of the risk factors of hypertension, sleep apnea and sleep disordered breathing difficulties

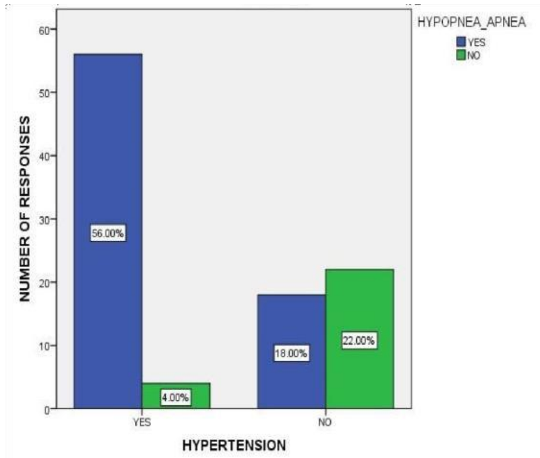

Figure 9: Bar graph showing the association between hypertension and prevalence of hypopnea/apnea. X axis represents prevalence of hypertension and Y- axis represents the number of responses of participants. Blue denotes the response ‘yes’ and green denotes ‘no’. 56% of participants had symptoms of hypopnea and apnea along with hypertension, 18% who responded yes (Green colour) had no symptoms of hypopnea and apnea. Chi square test (Pearson Chi square test value=29.141; DF=1) showing p=0.001 ($p<0.05$) was done and it was statistically significant, proving that there was a significant association between hypertension and prevalence of hypopnea and apnea.

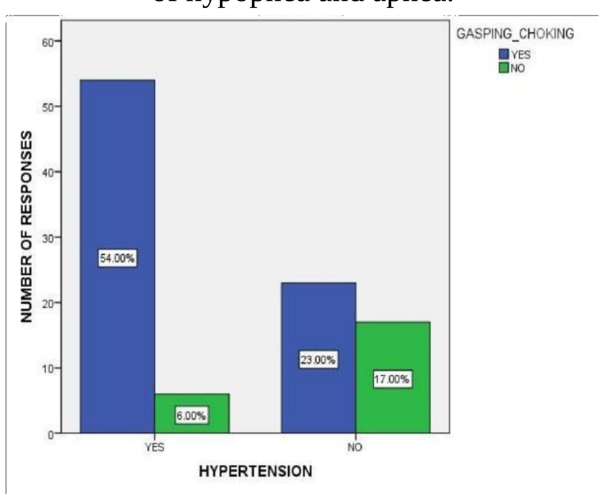

Figure 10: Bar graph showing the association between hypertension and prevalence of gasping /choking. X axis represents the status of hypertension and Y- axis represents the number of responses of participants. Blue denotes the response ‘yes’ and green denotes ‘no’: 54% participants responded yes (Blue colour) had symptoms of gasping /choking during night hours along with hypertension. Chi square test was done and the association was found to be statistically significant. Pearson chi square value : 14.314; DF:1; p value : 0.001 (<0.05) hence proving that there is a significant association between hypertension and symptoms of gasping/choking.

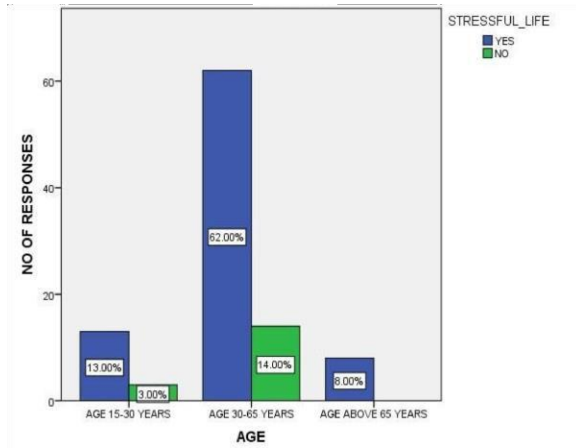

Figure 11: Bar graph showing the association between age groups of male and prevalence of stressful life. X axis represents different age groups of male and Y- axis represents the number of responses of participants. Blue denotes the response 'yes' and green denotes 'no'. 62% responded Yes (Blue Colour) in the age group of 30-65 years for leading a stressful life. This indicates that male population of the age group ranging between 30-65 are leading a more stressful life when compared to other age groups. Chi square test was done and association was found to be not statistically significant. Pearson chi square value : 1.782; DF:2; p value : 0.410 (>0.05) hence not statistically significant, proving that there is no significant association between age groups and stressful life.

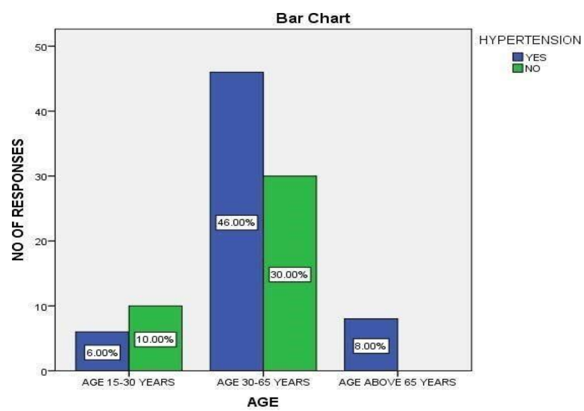

Figure 12 Bar graph showing the association between age groups of male and prevalence of hypertension . X axis represents different age groups of male and Y- axis represents the number of responses of participants. Blue denotes the response 'yes' and green denotes 'no': 30-45 years - 46% responded Yes (Blue Color) for being hypertensive. This indicates that male population of the age group ranging between 30-65 years are more hypertensive when compared to other age groups. Chi square test was done and association was found to be statistically significant. Pearson chi square value : 8.717; DF:2; p value : 0.013 (<0.05) hence statistically significant, proving that there is a significant association between age groups and hypertension.