ORIGINAL ARTICLE

Prevalence of High Risk for Obstructive Sleep Apnoea and Its Risk Factors among Adults Attending Government Primary Health Clinics in Kuantan

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ABSTRACT

INTRODUCTION: Obstructive sleep apnoea (OSA) is a sleep-related breathing disorder with recurrent episodes of apnoea or hypopnoea occurring during sleep. It is associated with an increased risk of cardiovascular disease. However, there is no applicable study that assesses the risk for OSA at the primary care level. This study aims to assess the prevalence of risk for OSA and its associated risk factors among adults attending primary care clinics. **MATERIALS AND METHOD**: This cross-sectional study was conducted among 252 adults attending four Klinik Kesihatan in Kuantan, Pahang. A self-administered validated Malay version of the Berlin Questionnaire was used to screen for the High Risk of OSA. The statistical analyses were done using t-statistics and chi-squared test then proceeded with binary logistic regression. **RESULTS**: The mean age of respondents was 53.3. Most of the respondents were male (54%), Malay (87.7%), and married (79.4%). The prevalence of High Risk for OSA was 32.9%. Among these, 94% of them presented with snoring and 16.9% presented with excessive daytime sleepiness. The risk factors that were significantly associated with High Risk of OSA includes younger age (AOR=0.951 CI=0.923-0.980); higher Body Mass Index (BMI) classification with obese type 1 (AOR=2.604 CI=1.278-5.308), obese type 2 (AOR=3.882 CI=1.078-13.975) and obese type 3 (AOR=6.800 CI=1.164-39.717); higher neck circumference (AOR=1.109 CI=1.007-1.221); hypertension (AOR=2.297 CI=1.122-4.702); and hypercholesterolaemia (AOR=2.040 CI=1.050-3.965). **CONCLUSIONS:** Nearly one-third of the adults attending primary health clinics were at High Risk for OSA. Screening for OSA was recommended particularly among those of younger age, higher BMI classification, and with co-morbidities.

KEYWORDS: Obstructive sleep apnoea, Belin Questionnaire, Primary Health Clinic

INTRODUCTION

Obstructive sleep apnoea (OSA) is a sleep-related breathing disorder with recurrent episodes of apnoea or hypopnoea occurring during sleep. OSA may present with snoring, breathing pauses, or excessive daytime sleepiness. Community-dwelling adult in Malaysia was shown to have a prevalence of 47.3% habitual snorers, 15.2% breathing pauses, and 14.8% excessive daytime sleepiness.[1] Comparatively, a study in Singapore reported a lower prevalence of snorers at 6.8%.[2] Globally, a review article showed that the prevalence of OSA in multiple countries including the United States of America, China, Spain, India, Korea, Japan, and Sweden had a mean of 22% in males and 17% in women.[3] The diagnosis of OSA is confirmed with formal full-night polysomnography. The sleep study was costly and had limited access; thus, it is important to stratify those at risk for OSA through a questionnaire. Studies assessing for OSA or Risk for OSA in Malaysia mainly assessed a specific group of the population such as bus drivers, pregnant ladies, or diabetic patients.[4–6] The prevalence

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for OSA found in these studies were 44.3%, 8.2%, and 32% respectively. However, there was no applicable study that assesses the risk for OSA among adults in the local population. Furthermore, Malaysia is also known to have the most obese populations in South East Asia with a rapid increase in the incidence of obesity.[7] These created a concern for a larger proportion of OSA among the Malaysian population.

OSA is associated with an increased risk of cardiovascular disease (CVD) and prone to accidents. Epidemiological studies have consistently shown an association between sleep disorders and CVD (coronary artery disease, heart failure, hypertension, and stroke) and metabolic disorders. Severe intermittent hypoxaemia, increased blood pressure and sympathetic vasoconstriction may contribute to the origin and progression of coronary artery disease.[8] The number of individuals who are diagnosed with OSA and treated is very small compared to more than 85% who remain undiagnosed.[8] Thus, it is important to screen for OSA particularly in the high-risk group.

This study aims to assess the prevalence of risk for OSA and OSA symptoms and its associated risk factors among adults attending primary care clinics.

MATERIALS AND METHODS

This was a cross-sectional study done over one-year from June 2018 to May 2019. The study location was in Kuantan District in Pahang State. Kuantan is the state capital of Pahang and has more than 500,000 population. It consists of both rural and urban populations. The inclusion criteria were adults age 30 years old and above. This was used by adopting age inclusion criteria in other studies globally.[9,10] It is also recommended to screen for cardiovascular risk in adults aged more than 30. Those with known hypothyroidism, depression, and pregnancy were excluded. The sample size was calculated using Openepi.com Open Source Statistics for Public Health software with the prevalence of OSAS based on Singapore study[9] and with 20% non-respond rate-making total sample size required at 235. Four out of eleven Klinik Kesihatan (KK) in the Kuantan district was purposively sampled. The four KK were KK Paya Besar, KK Jaya Gading, KK Bandar Kuantan and KK Balok. These four clinics constitute both the rural and urban region of Kuantan. Respondents were recruited by using systematic sampling where every third adult was approached. Data collection was done using a questionnaire while respondents waiting for a clinic consultation. The questionnaire consisted of demographic information, the Berlin Questionnaire, and anthropometric measurements.

Berlin Questionnaire

There were few questionnaires used to screen for OSA including Berlin Questionnaire (BQ), STOP-BANG questionnaire and Epworth Sleeping Scale (ESS) questionnaire. When compared for clinical utility, BQ and STOP-BANG questionnaire had the highest sensitivities to detect OSA and should be used to screen for OSA [11]. BQ was chosen for this study because of highest sensitivity as well as the presence of validation study in the Malay language. The validated Malay version of the Berlin Questionnaire (Berlin-M) was used to stratify respondents to High or Low Risk for OSA. Berlin-M had a sensitivity of 92% and specificity of 17% to screen for OSA.[12] Berlin Questionnaire consisted of three categories concerning snoring, excessive daytime sleepiness and medical condition such as hypertension or obesity. Respondents were categorised as High Risk for OSA when two or more categories scored positive in the questionnaire.[13]

Anthropometric measurements

Respondents were also subjected to basic physical examination to obtain blood pressure, height, weight, neck, and waist circumference. Height was measured with a body meter and weight was measured with a weighing scale. Respondent was needed to stand barefoot in a straight manner on top of the measuring equipment. Body Mass Index (BMI) was calculated and classified according to Asian specific BMI classification.[7] Waist and neck circumference was measured with measuring tape. The anatomical landmark for measuring waist circumference was midway between the inferior margin of the last rib and the crest of the ilium in a horizontal plane without compressing soft tissues. The landmark for measuring neck circumference was around Adam's apple in a horizontal plane. Blood pressure (BP) was measured with a sphygmomanometer as per clinical practice guidelines.[14]

Data analysis

Data analysis was done by IBM SPSS statistic version 23 Armonk, NY: IBM Corp. The distribution of baseline characteristics of respondents was described using mean and standard deviation for numerical variables and using frequency and percentage for categorical variables. Prevalence of Risk for OSA and OSA symptoms was described in frequency and percentage. The association was analysed using t-statistics and chi-squared test, then proceed with multivariate analysis using binary logistic regression. The continuous variables that were normally distributed were analysed using t-statistics. The significant value was taken at p-value <0.05.

Ethical considerations

The study was registered to National Medical Research Register (NMRR) with NMRR ID: NMRR-18-844-40754 and with approval from the Medical Research and Ethics committee (MREC).

RESULTS

Demographic

A total of 252 respondents has been collected. Table I shows the baseline characteristics of the sample population. The mean age of the sample population is 53.3 years old. Most of the respondents were male (54%), Malay (87.7%), and married (79.4%). A large majority of the respondents (86.3%) were in the overweight category with 34.1%, 42.1%, 6.3%, and 4% of them in the Pre-Obese, Obese Type 1, Obese Type 2, and Obese Type 3, respectively.

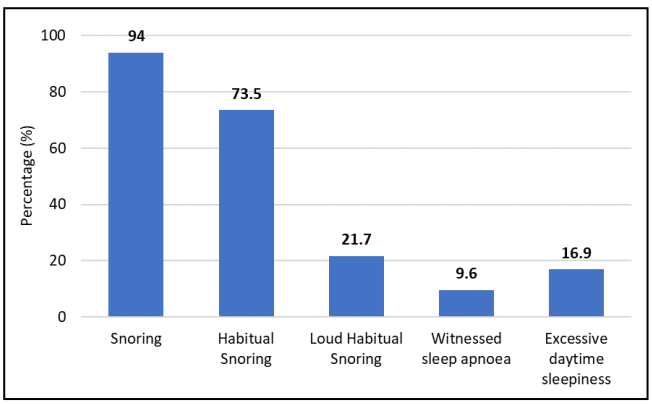

Figure I: Prevalence of symptoms of OSA among High Risk for OSA

Table I Baseline characteristic of sample population (n=252)

Variable		n (%)
Age		53.3(12.7) *
Gender		
	Male	136 (54)
	Female	116(46)
Ethnicity		
	Malay	221(87.7)
	Chinese	21(8.3)
	Indian	10(4)
Education		
	Primary	50(19.8)
	Secondary	158(62.7)
	Tertiary	44(17.5)
Marriage		
	Married	200(79.4)
	Divorced	37(14.7)
	Single	15(6)
BMI		
	Underweight	4(1.6)
	Normal	30(11.9)
	Pre-Obese	86(34.1)
	Obese Type 1	106(42.1)
	Obese Type 2	16(6.3)
	Obese Type 3	10(4)
Neck Circumference		38.6(3.9)*
Waist Circumference		93.3(12.9)*
Smoking		48(19)
Diabetes		81(32.1)
Hypertension		140(55.6)
Dyslipidaemia		123(48.8)

*described in mean (SD)

Prevalence of High Risk for OSA

The prevalence of High Risk for OSA in the study was 32.9% (n=83). Figure I showed the prevalence of symptoms of OSA among those at High Risk for OSA. Most of them had snoring 94% (n=78) but only a small proportion, 9.6% (n=8) presented with witnessed sleep apnoea, and 16.9% (n=14) presented with excessive daytime sleepiness.

Associated factors

Individually, age, obesity, neck circumference, and waist circumference were significantly associated with High Risk for OSA as shown in Table II. Waist circumference was removed from the binary logistic regression analysis as the factor was highly correlated with BMI with r = 0.84.

From table III, few risk factors were found significantly associated with the High Risk of OSA after adjustments such as age, BMI classification, neck circumference, hypertension, and hyperlipidaemia.

Table II: Bivariate analysis of baseline characteristics with Risk of OSA

Variable		High Risk OSA	Low Risk OSA	Chi-Squared (df)	p-value
		n (%)	n (%)		
Age		49.6(11.5)*	55.1(12.9)*	250**	0.001**
Gender					
	Male	48(35.3)	88(64.7)	1	0.389
	Female	35(30.2)	81(69.8)		
Ethnicity					
	Malay	72(32.6)	149(67.4)	1	0.747
	Non-Malay	11(35.5)	20(64.5)		
BMI					
	Normal	20(16.7)	100(83.3)	3	<0.001
	Obese Type 1	45(42.5)	61(57.5)		
	Obese Type 2	10(62.5)	6(37.5)		
	Obese Type 3	8(80.0)	2(20.0)		
Neck Circumference		40.5(4.0)*	37.6(3.5)*	250**	<0.001**
Waist Circumference		100.6(13.2)*	89.7(11.2)*	250**	<0.001**
Smoking					
	Yes	19(39.6)	29(60.4)	1	0.276
	No	64(31.4)	140(68.6)		
DM					
	Yes	29(35.8)	52(64.2)	1	0.505
	No	54(31.6)	117(68.4)		
HPT					
	Yes	53(37.9)	87(62.1)	1	0.063
	No	30(26.8)	82(73.2)		
Dyslipidaemia					
	Yes	46(37.4)	77(62.6)	1	0.141

* described in mean (SD)
** analysed using t statistics

Regarding the age factor, every 1-year increment of age reduced the odds of High Risk for OSA by 5% (AOR=0.951 CI=0.923-0.980). A higher BMI classification was associated with a High Risk for OSA where obese type 1 doubles the odds (AOR=2.604 CI=1.278-5.308), obese type 2 triples the odds (AOR=3.882 CI=1.078-13.975) and obese type 3 has six times more odds to has High Risk for OSA (AOR=6.800 CI=1.164-39.717). A higher neck circumference where every 1cm increment of neck circumference increased odds of High Risk for OSA by 11% (AOR=1.109 CI=1.007-1.221). The presence of hypertension doubles the odds of High Risk for OSA (AOR=2.297 CI=1.122-4.702). And lastly, the presence of dyslipidaemia doubles the odds of High Risk for OSA (AOR=2.040 CI=1.050-3.965).

DISCUSSION

The demographic of the sample population reflected the population in the Kuantan district, but with a higher Malay proportion. This may be contributed by a higher preference of the Malay race to attend primary health clinics in Kuantan. The prevalence of High Risk for OSA in the study was around one-third of the sample population. This was higher than the prevalence of OSA found in the review article worldwide.[3] The prevalence of snoring and habitual snoring in this study was 62.3 and 28.2% respectively. Compared to the large population-based study done locally, there was a similar prevalence of snoring but a lower prevalence of habitual snoring[1]. Comparatively, Singapore had a much lower prevalence of snoring around 6.8%[2]

Table III: Logistic Regression of associated factors for High Risk for OSA

Factors		Crude OR (95% CI)	Adjusted OR (95% CI)	p-Value
Age		0.964 (0.943-0.986)	0.951 (0.923-0.980)	0.001
Obesity	Normal	1	1	
	Obese Type 1	3.689 (1.993-6.826)	2.604 (1.278-5.308)	0.008
	Obese Type 2	8.333 (2.718-25.546)	3.882 (1.078-3.975)	0.038
	Obese Type 3	20.000 (3.949-01.280)	6.800 (1.164-9.717)	0.033
Neck Circumference		1.228 (1.134-1.329)	1.109 (1.007-1.221)	0.035
Hypertension		1.825 (1.009-3.301)	2.297 (1.122-4.702)	0.023
Dyslipidaemia		1.485 (0.876-2.519)	2.040 (1.050-3.965)	0.035

Adjusted for age, obesity, neck circumference, hypertension, dyslipidaemia
Backward LR method was applied
Constant: -3.664
Hosmer and Lemeshow test, p value= 0.755
The area under the Receiver Operating Characteristics (ROC) curve was 77.5%

The commonest symptom for those of High Risk for OSA was snoring (94%). And only a small proportion of them presented with excessive daytime sleepiness (16.9%) or witnessed sleep apnoea (9.6%). This showed that even without these symptoms, a patient may have OSA and needed to be screened.

Contrary to other studies, it was found that the lower age was associated with a High Risk for OSA. This may be contributed by the reduction in the prevalence of obesity as the age increases in the study population. This may also be contributed by differences in fat mass and fat distribution in the population. The differences in fat mass and distribution are what contributed to the disparity between the WHO obesity cut off point and Asian obesity cut off point.[7] Furthermore, a study done in the UK showed that South Asians had a significantly younger age having Sleep Disordered Breathing compared to Caucasians.[15] In another study in the UK, those with severe OSA, South Asians respondents were seven years younger than White Europeans.[16]

Obesity was a major risk factor for snoring and sleep apnoea and this had been shown in this study as well as other global and local studies.[1,2,4,17] This study found that the odds for High Risk of OSA increased along with increasing obesity type. The finding was supported by a similar finding in the local study among the diabetic population.[6] It was found that a 10% weight gain predicted a corresponding 32% increase in the AHI and a six-fold increase in the risk of developing moderate to severe OSA. Alternatively, a 10% weight loss predicted a 26% decrease in the AHI.[18] Losing weight is effective in improving and in some cases resolving OSA.[19]

Hypertension and dyslipidaemia were also significantly associated with a High Risk for OSA. This was supported by multiple studies both locally and globally.[1,3,4,20] In a meta-analysis of 44 studies, management of OSA with Continuous Positive Airway Pressure (CPAP) had a small effect on blood pressure where there was 2.6 mmHg reduction in systolic BP and a 2-mmHg reduction in diastolic BP.[21] Combining weight loss and CPAP may result in incremental reductions in BP as compared with either intervention alone.

Neck Circumference was significantly associated with High-Risk for OSA. This was also seen in studies done in Singapore and the local study among bus drivers.[2,4] A wider neck circumference was contributed by pharyngeal fat where pharyngeal fat and its volume were shown to be related to the presence and degree of OSA.[22]

There were several limitations identified in the study. This was a cross-sectional study; therefore, a causal relationship cannot be inferred from the study. Additionally, this study does not ascertain the prevalence of OSA disease itself as the questionnaire is a screening tool for OSA. The questionnaire was also subjected to recall bias as the respondents need to recall their symptoms that occur during sleep.

CONCLUSION

Nearly one-third of the adults attending primary health clinics were at High Risk for OSA. These individuals were subsequently referred to as Ear, Nose, and Throat Clinic for further evaluation. It is important for health care professionals to identify individuals at High Risk for OSA, as OSA predisposes patients toward cardiovascular disease or may lead to MVA. Despite

advancing age showed reduced risk, other cardiovascular risk factors such as higher BMI classification, presence of hypertension, and dyslipidaemia showed an increased risk for High Risk of OSA. Screening for OSA was recommended particularly among those of younger age, obese, large neck circumference, and with co-morbidities. Further studies may be done to observe the effect of age on OSA and to determine the prevalence of OSA in the population.

Conflict of Interest

The study was investigator-initiated and self-funded. The authors declare no conflict of interest.

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