JMSCR Vol||06||Issue||02||Page 107-118||February 2018

www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v6i2.18

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

The Relationship between Obstructive Sleep Apnea and the Nasofacial Anthropometry of Sikkimese Subjects

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Abstract
Introduction: *Obstructive sleep apnea (OSA) is a sleep disordered breathing caused by obstruction at the pharyngeal level of the airway. This is a hitherto undiagnosed condition which has incipiently imposed itself on the society as a potential threat. In perspective of the state of Sikkim and given the morphological disposition of cranio-facial anatomy in the local inhabitants it is now realized that Obstructive Sleep Apnea (OSA) is a significantly frequent occurrence.*
Aims: *To assess the frequency of OSA in the population of Sikkim and correlate with craniofacial anthropometry of the same population.*
Methods and Material: *A subjective assessment was done using Berlin Questionnaire and Answers and craniofacial anthropometry of participants were measured and calculated. Participants were from Tertiary Care Hospital and Sikkim Manipal University Campus.*
The data were recorded on a predesigned data sheet and managed on an 'Excel' spreadsheet and requisite statistical and descriptive analyses were done.
Results: *The Nepali adult's majority had nasal index of 64.2 ± 18.35, implying leptorrhine nose type and facial index of 106 ± 5.53 implying hyper leptoproscopic face. These groups had the maximum risk of OSA.*
Nasal Index of Bhutia adults was 62.1 ± 5.87, indicating the dominance of Leptorrhine nose type. Their facial index showed 106.2 ± 12.67 indicating the dominance of the hyper leptoproscopic face type.
Lepc has nasal index was calculated to be 76.0 ± 8.6 with predominatly Mesorrhine nose type and facial index of 106.1 ± 8.8. Which is hyper leptoproscopic and these ethnic group had the least risk of OSA .
Conclusion: *This is a simple study using Berlin Questionnnaire as a tool for identifying OSA and its relation with awareness and nasofacial anthropometry. In conclusion we can say that Facial and Nasal Indices which varies between ethnicity can be used as a predictor for OSA as a cephalometeric measurement of the face and nose. Many predictors are being sought for easily diagnosing and predicting OSA. This will lead to early better management strategies for this disorder.*
Keywords: *Pharyngeal Obstruction, Snoring, Facial Index, Nasal Index.*

Introduction

Obstructive sleep apnea has been acknowledged in medical literature since last century, however the frequency and long-term implications came to be appreciated in 1980[1]. Obstructive sleep apnea is a type of sleep disorder that involves cessation or significant decrease in airflow in the presence of breathing effort[2]. It is reported to be the most common type of sleep-disordered breathing and is characterized by recurrent episodes of upper airway collapse during sleep[3]. Obstructive sleep disordered breathing is found in approximately 5 % – 10 % of the general adult population[4]. This disorder occurs predominantly in the middle-aged population disturbing the normal sleep architecture[3]. There have been many studies to support the fact that ethnic anatomical morphology variation leads to the probability of Obstructive sleep apnea[5]. Possible reasons for this difference between frequency of Obstructive sleep apnea have been attributed to cephalometric variations. This variation also points towards the possibility of an osteogenic etiology of Obstructive sleep apnea [6]. Some studies like the one from China found that craniofacial structures and obesity contributed differentially to Obstructive sleep apnea in two ethnic groups[7]. The joint committee (JNC-7) on prevention, detection, evaluation and treatment of high blood pressure recognizes Obstructive sleep apnea as a significant risk factor for hypertension[8]. The impact and burden of unrecognized obstructive sleep apnea is multiplied by the long-term possibility of strokes, poor recovery rate and impaired neuro cognitive ability[9].

Anthropometry is the hallmark technique that deals with the study of body proportion and absolute dimensions that vary widely with age and sex within and between racial groups[10]. The present work was done to find out the relationship between the Obstructive sleep apnea occurrence and naso-facial anthropometric measurements of major ethnic groups amongst Sikkimese population. No published study has been done till date to assess the risk of Obstructive sleep apnea in Sikkimese population. This study is an analysis of two separate studies by the author part of one study being Naso-facial anthropometric study of Female Sikkimese University Students[11]. The observed short stature and craniofacial features could lead to an increased risk of Obstructive sleep apnea in the Sikkimese population and since there are no prior studies regarding the same, the current study might throw some light into this.

Materials & Methods

The study was conducted in the Sikkim Manipal University and Central Referral Hospital, the teaching hospital of the Sikkim Manipal Institute of Medical Sciences, Gangtok Sikkim, after obtaining requisite permissions from the hospital administration and clearance from Institutional Ethics Committee. The studies spanned a period from the February 2015 to January 2017. This was an analytical work of two separate studies conducted by the same authors in the same setup. One of the these two study being Naso-facial anthropometric study of Female Sikkimese University Students[11].

Simple randomized sampling from Hospital Patients and University Students were done to collect the sample.

Inclusion & Exclusion Criteria

The sample included students attending the Sikkim Manipal University and Patient Attendants in the Central Referral Hospital who were born and brought up in Sikkim and belonging to one of the ethnic groups of Sikkim (Nepali/ Bhutia/ Lepcha).

The subjects not willing to participate in measurements or the questionnaire and /or having a prior history of Maxillofacial Trauma/ Surgeries / Congenital Deformities in Face and/or having inter-ethnic group lineage/ parentage were excluded from the sampling

Methods of data collection

An informed written consent of the individuals participating was taken. Complete anonymity of the subjects and their questionnaire answers was maintained. The subjects were explained about the study and all questions and doubts were clarified.

Blood pressure was measured with a mercury sphygmomanometer to the nearest 2 mmHg in recumbent position after at least five minutes of rest.

Participants were advised to refrain from smoking or ingesting caffeine for 30 min prior to blood pressure measurement.

In case of an abnormal blood pressure recording, another reading was obtained after a gap of five minutes rest.

An average of four readings each 5 minutes apart for systolic and diastolic pressure were taken for analysis. The mercury sphygmomanometer was periodically validated against a Hawksley Random Zero Sphygmomanometer (Hawksley, Lancing, Sussex, and UK).

Height was measured to the nearest 1 cm then converted to meters

Body weight was recorded (to nearest 0.5 kg) in all patients, in erect position without shoes and wearing only light indoor clothes, with an electronic scale (Tanita body composition analyzer-TBF 300 G.S., Japan)

Body mass index (BMI) was calculated as body weight/height^2 (kg/m^2)

Neck circumference (NC) was measured at the level of cricothyroid membrane using a non-elastic measuring tape.

Neck length (NL) was measured from occipital tubercle to the vertebra prominence using non-elastic measuring tape.

Questionnaire

Participants were asked to answer "The Modified Berlin Questionnaire"[12] consisting of 12 questions. The Questionnaire which had been developed to suit Asian populations defining obesity as BMI≥25 kg/m^2 having a sensitivity of 85% and specificity of 95% which has 3 categories and assesses the risk under the following categories: -

Category 1- Snoring (6 questions)

Category 2-Wake time sleepiness (5 questions)

Category 3-High blood pressure and BMI (1 question)

It also includes 5 questions to assess the awareness.

Pre-determination of high risk and lower risk for OSA was based on responses in three symptom categories. In category 1, high risk was defined as persistent symptoms (>3 to 4 times/wk.) in two or more questions about their snoring. In category 2, high risk was defined as persistent symptoms (>3 to 4 times/wk.) in two or more questions about their wake time sleepiness. In category 3, high risk was defined as BMI above 25 kg/m or a Blood pressure according to the 8th JNC of 140/90 or higher above to qualify as high risk for at least two symptom categories. If person has 2 or more categories high risk then person is placed at high risk category for OSA[12]. For awareness correct answer to any 3 questions are considered as aware.

For anthropometric measurements, the subjects were made to sit comfortably on a chair with the head held out straight in the anatomical position.

The nasal length and nasal width was measured in centimeters using spreading calipers. The nasal length was measured as the straight distance from the nasion to the subnasale, while the nasal width was measured at the nasal base from ala to ala. (See Table/Figure 1)

Each measurement was taken twice and the average taken. The nasal index was then calculated by dividing the nasal width by the nasal length and multiplying by 100

Williams et al[13] has grouped the human nose using the nasal index. The human nose can be grouped into three classes, the leptorrhine (long and narrow nose), the mesorrhine (medium) and the platyrrhine (broad nose) nose types using the nasal index. A nose type is said to be leptorrhine if the nasal index is 69.9 or less, mesorrhine if the nasal index is between 70-84.9 and platyrrhine if the nasal index is 85 and above.

The human face type can be classified into the following types according to the facial Index, which is a ratio of the facial width to the facial height multiplied by 100. According to Wiliams et al [13] there are five categories of face based on the facial index namely: Hyper Euryproscopic (very broad, short face with Facial Index <80), Euryproscopic (broad, short face with Facial Index 79.0-83.9), Mesoproscopic (normoprospic, average face with Facial Index 84.0-87.9), Leptoproscopic (tall, narrow face with facial Index 88.0-92.9) and hyper leptoproscopic (very tall, narrow face with Facial Index >=93).

The facial height was measured as the straight distance from the nasion to the gnathion, while the facial width is measured from zygion to zygion. (See Table/ Figure 1)

Sikkim, a state in the Republic of India is a multi-ethnic state. The ethnic groups comprise of the Lepchas, the Bhutias and the Nepalese and distribution of groups were done accordingly.[14]

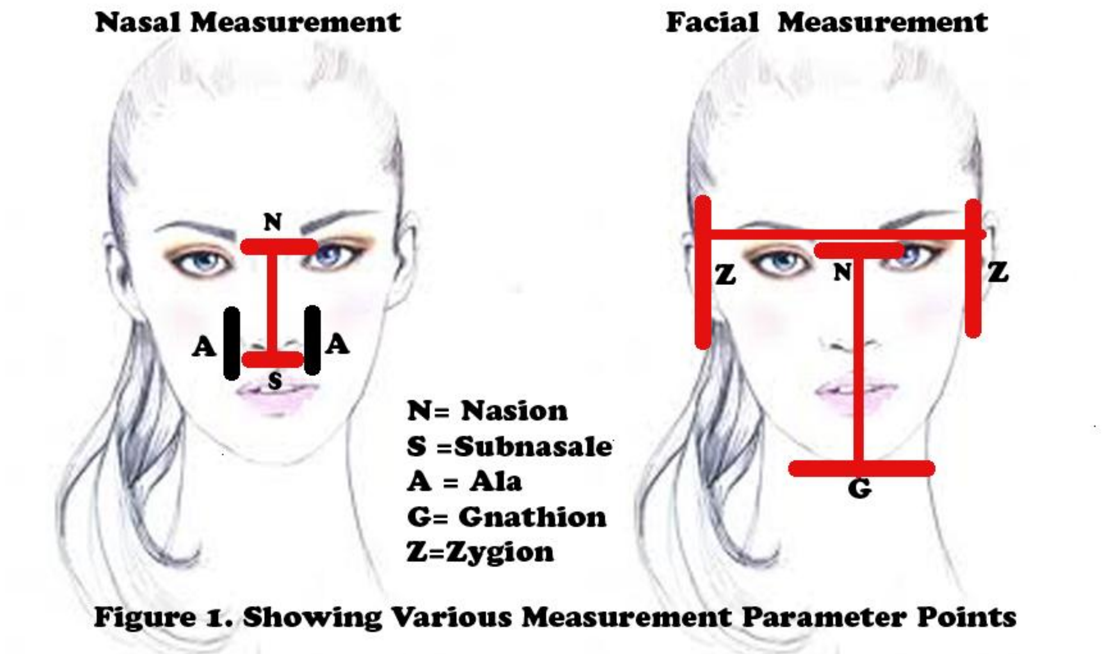

Figure 1. Showing Various Measurement Parameter Points

Statistical Analysis

Data was recorded on a predesigned data sheet and managed on an ‘Excel’ spreadsheet. Requisite statistical and descriptive analysis was done.

Results

Gender and Age Distribution for Berlin Questionnaire Analysis

Total Number of Subjects was 410 out of which 96 were later excluded.

Males: 205

Mean age = 42.19 years (SD ±13.809 years)

Females: 205

Mean age =43.55 years (SD ±13.925 years)

The Age ranged from 21 -85 years non gender specific with the non-gender specific mean age being 42.87 years (SD = ±13.866 years).

Table /Figure 2: Distribution of Ethnicity

Ethnic Group (n)	Total Population (n= 410)		Subjects at High Risk (n=190)		Subject aware of OSA (n=54)	
	Male (n=205)	Female (n=205)	Male (n=96)	Female (n=94)	Male (n=25)	Female (n=29)
Nepali (215)	102	113	54	66	16	15
Lepcha (26)	14	12	7	5	2	1
Bhutia (73)	38	35	16	14	5	9
Excluded (Non Ethnic/Mixed)	51	45	19	9	2	4

Risk Factor & Awareness Analysis

A total of 410 individuals attempted and completed the questionnaire. 314 out of them were fulfilling the inclusion criteria for the study and hence were taken to complete the study

Out of these 314 individuals 162 were found to be at high-risk for OSA according to "The Modified Berlin Questionnaire" and when all 410 were considered then 190 were found to be at high risk

The prevalence estimate of individuals at high-risk for OSA was 46.34% of the 410 respondents and when only the ethnic population of 314 was considered it was found to be higher at 51.6%.

Coming to awareness of OSA, only 54 out of 411 subjects (13.13%) were found to be aware of the OSAS. When only the ethnic population was considered then 15.28% were found to be aware. (See Table/Figure 2)

Hypertension was reported by 49 individuals (11.9%). Of these 34 (69.3%) were males. Among the high-risk group 27.22% individuals had high blood pressure as compared to 4.3% of those in the low-risk group. Hypertension was found to be more prevalent in the high risk group for OSA (Chi square $p<0.0001$).

Table/Figure 3

Community Distribution	Nasal Index: Average Nasal Index of group	Leptorrhine: N (%)	Leptorrhine: Average Nasal Index	Mesorrhine: N(%)	Mesorrhine: Average Nasal Index	Platyrrhine: N(%)	Platyrrhine: Average Nasal Index	Subjects with High Risk of OSA (% in each ethnic group)
Nepali	64.2 ± 18.35	113(52.5)	64.2	88(41)	75.6	14 (6.5)	90.4	120 (55.81)
Bhutia	62.1 ± 5.87	38 (52.05)	62.1	35(47.95)	76.1	-	-	30 (46.12)
Lepcha	76.0 ± 8.6	12 (46.15)	65.1	14(53.84)	76.0	-	-	12 (41.09)

Table/Figure 3 shows the risk of OSA in various Ethnic population and the Nasal Anthopometric classification according to ethnicity.

The majority of the population in Sikkim is Nepali and they represented more than 50% of the study sample. The average Nepali population had a nasal index of 64.2 ± 18.35, and 52.5 % of these population had an average nasal Index of 64.2 implying majority Leptorrhine type of nose. These ethnic group had the maximum risk of OSA with 55.81 % of the community at risk . Nasal Index of Bhutia adults was 62.1 ± 5.87, with the dominance of Leptorrhine nose type. Lepchas nasal index was calculated to be 76.0 ± 8.6, They had predominatly Mesorrhine nose type with 53.4 % having Average Nasal Index of 76.0. This ethnic group had the least risk of OSA at 41.09% of the community at risk

Table/Figure 4.

Community Distribution	Facial Index (FI)									Subjects with High Risk of OSA (% in each ethnic group
	Average Facial Index	EP		MP		HLP		LP		
		N (%)	avg FI	N (%)	avg FI	N (%)	avg FI	N (%)	avg FI	
Nepali	106 ± 5.53	3(1.39)	83.7	12(5.58)	86.3	176(81.86)	106.5	24(11.16)	90.5	120 (55.81)
Bhutia	106.2 ± 12.67	-	-	5(6.84)	86.6	60 (82.19)	106.2	8(10.97)	90	30 (46.12)
Lepcha	106.1 ± 8.8	3(11.53)	83.2	-	-	23 (88.47)	106.1	-	-	12 (41.09)

Euryproscopic =EP , Mesoproscopic =MP, Hyperleptoproscopic HLP, Leptoproscopic LP

Table/Figure 4 shows the risk of OSA in various Ethnic population and the Facial Anthopometric classification according to ethnicity.

The Nepali had an average facial index of 106 ± 5.53 with a majority 176(81.86%) having hyper leptoproscopic face type with an average FI of 106.5. This ethnic community were found to be most at risk of OSA with 120 subjects (55.81%)of the sommunity at risk.

The average facial index of Bhutia showed 106.2 ± 12.67 with the dominance of the hyper leptoproscopic face type with 60 subjects (82.19 %) and an average FI of 82.19

Lepcha had an average facial index of 106.1 ± 8.8. They had majority of hyper leptoproscopic face type with 23 subjects (88.47%). This ethnic community had the least risk amongst all the groups. Hyper Euryproscopic type of facial structure was not encountered in any ethnic groups.

Discussion

Obstructive sleep apnea syndrome is characterized by repeated episodes of upper airway obstruction during sleep leading to sleep fragmentation. It consists of a spectrum of events starting with snoring to severe apneic spells at the nose and mouth during the effort to breathe. The probable cause of the syndrome is a combination of anatomical and neuromuscular abnormality leading to various degrees of obstruction of the upper airway[15]. Patients suffering from obstructive sleep disordered breathing have been found to have characteristic craniofacial morphology and or abnormal distribution of body fat[16].

Studies point out that Asian subjects who have Obstructive sleep apnea have a greater severity of the condition compared to age and gender controlled groups of whites[17]. Ethnicity and further racial variations of craniofacial anatomical features have been found to determine the rates of occurrence and severity of obstructive sleep apnea between groups. Asian subjects are known to have mandibulo - maxillary protrusion. Mandibular disparities have been established as a known cause of Obstructive sleep apnea syndrome[18].

However, the relationship of Obstructive sleep apnea syndrome to craniofacial anatomical make-up is complex and airway compromise may not be related to a single anthropometric measurement.

There are abundant scientific studies done on cephalometric and anthropometric measures, which compares control groups and snorers to Obstructive sleep apnea patients and aims at using these measurements as predictors of this condition.

Akpinar M[19] et al had a study to evaluate the cephalometric characteristics and investigate the measurement differences between habitual snorers and subjects with obstructive sleep apnea (OSA) in nonobese Turkish male population. The study design was prospective and nonrandomized. The setting is sleep-snoring center of referral hospital. Out of Total of 60 male subjects were taken with 20 each of OSA, habitual snorer and control group. Clinical evaluation, Epworth sleepiness scale scoring, flexible nasopharyngoscopy, polysomnography, Tweed and Delaire analysis on cephalometric images were performed. In comparison of OSA and habitual snorers, Posterior Airway Space (PAS) at palatal and tongue base level Mandibular Plane and Hyoid (MPH) Distance were found statistically different. In comparison of controls with OSA and habitual snorers PAS at palatal level, MPH, soft plate and thickness were found statistically different. The soft palate length, PAS, and MPH were detected as the most effective four parameters in discriminating three groups. From this study increased MPH, soft palate length and decreased PAS were identified as the determinant characteristics in OSA and habitual snoring group. PAS and MPH values reported were higher in OSA as compared to habitual snorers. Like wise in our study the facial Index and Nasal Index of various ethnic groups with Risk of OSA varied as stated before. These kinds of selected cephalo-metric data may be used as a complementary to endoscopic examination, sleep tests and imaging techniques to determine anatomic site, management plan and follow-up of outcome in habitual snorers and OSA subjects.

In a study by Davies RJ[20] the retrospective analysis of one hundred and fifty patients referred to a sleep clinic for investigation of sleep related breathing disorders showed that the question "Do you fall asleep during the day, particularly when not busy?" was the best questionnaire predictor of variance in the SaO2 dip rate. This analysis also showed that neither body mass index nor any of the questionnaire variables improved the amount of variance explained by height corrected neck circumference alone. In this study Body mass index and neck circumference corrected for height were measured and a questionnaire covering daytime sleepiness, snoring, driving, and nasal disease were used to collect data. The current study is a similar study with questionnaire and anthopometric measurements and combined study like these with a questionnaire and objective measurements find a role in the research of OSAS

A Retrospective analysis of a cohort of OSA patients was done by Ferguson KA[21]. The relationships between neck circumference (NC), body mass index, apnea severity, and craniofacial and upper airway soft-tissue measurements from upright lateral cephalometry were examined. They drew a conclusion that there is a spectrum of upper airway soft-tissue and craniofacial abnormalities among OSA patients: obese patients with increased upper airway soft-tissue structures, non-obese patients with abnormal craniofacial structure, and an intermediate group of patients with abnormalities in both craniofacial structure and upper airway soft-tissue structures. Likewise in our study depending on the various facial and nasal Index it is possible to divide groups of subjects into various groups and predict the Risk of OSA being associated with certain facial characteristics like Leptorrhine nasal type being associated with risk of OSA. Also most of the at risk patients had a Hyper leptoproscopic face though it has not been statistically validated. A multi centric study in the state can be recommended for identifying the Face and Nasal Structure of established OSA patients.

Partinen M et al[22] have done study on Obstructive sleep apnea and cephalometric measurements through roentgenograms. Different variables, including cephalometric landmarks, body mass index (BMI), and polygraphic results (particularly degree of O2 saturation and number of abnormal breathing events), were statistically analyzed. The study subjects were subdivided into (a) patients with clear anatomic abnormalities and low BMI, (b) patients with morbid obesity with few abnormal cephalometric measurements, and (c) patients who have variably increased BMI and abnormal cephalometric measurements. The cephalometric variables were found to be much less useful for predicting frequency of O2 saturation drops below 80 percent. In the current study facial and nasal measurements were used by taking actual measurements. On the lines of this study, the current study can be modified to take basal and facial anthopometric measurements through Xray of skull which would be easier to analyse and also more accurate of bony anthropometry of skull.

Another study by Yucel A et al [23] in evaluation of the upper airway cross-sectional area changes in different degrees of severity of obstructive sleep apnea syndrome has cephalometeric measurements and dynamic CT study. Patients with severe OSAS had significantly narrower cross-sectional area at the level of uvula in expiration, more inferiorly positioned hyoid bone, and thicker soft palate compared with patients with mild/moderate OSAS and the control group. In addition, severe OSAS patients had bigger neck circumference than those in the control group.

Mayer P et al[24] in a study to study the Relationship between body mass index, age and upper airway measurements in snorers and sleep apnoea patients have found out that the anatomy varies with BMI. To assess a possible sleep-related breathing disorder subjects had complete polysomnography, cephalometry and upper airway computed tomography. For the whole population, OSA patients had more upper airway abnormalities than snorers. When subdivided for BMI and age, however, only lean or younger OSA patients were significantly different from snorers as regards their upper airway anatomy.

In addition, there are few studies on the various phenotypic features that may contribute differently to the development of OSA. Lee et al [25] have evaluated the differences in craniofacial structure and obesity in 150 adults with Obstructive sleep apnea (74 Caucasians and 76 Chinese). Anthropometry, cephalometry, and polysomnography were performed and compared between the subgroup after matching for body mass index and OSA severity. The mean age and BMI were similar between the ethnic groups. Chinese patients had more severe OSA. They also had more craniofacial bony restriction, including a shorter cranial base, maxilla and mandible length. These findings remained after correction for differences in body height. Similar results were shown in the BMI-matched analysis. When matched for OSA severity Chinese patients had more craniofacial bony restriction, but Caucasian patients were more overweight and had a larger neck; however, the ratios of BMI to the mandible or maxilla size were similar. Craniofacial factors and obesity contribute differentially to OSA in Caucasian and Chinese patients. For the same degree of OSA severity, Caucasians were more overweight, whereas Chinese exhibited more craniofacial bony restriction. In our study the three ethnic groups, The Lepchas and Bhutias more closely resemble the Chinese genetically both being Mongolian Ethnic Groups , the nepali group basically being a mix of Causacian descendants and Aryo Dravidian Descent.

No prior studies were found published regarding the Nepalis, Bhutia or Lepchas anthropometry and Obstructive sleep apnea. In our study we found out that maximum risk of OSA at 55.81 % was in the Nepali group and they had Leptorrhine nose type predominance, and Lepcha with the least risk of OSA at 41.09 % were predominantly Mesorrhine nose type. All the OSA at risk individuals in all ethnic groups were found to have hyper leptoproscopic type of facial index.

The present study being a pilot study of a kind in a small state posed a lot of limitation. Nasofacial anthropometry were limited to only by measuring the facial distances and calculating Nasal and Facial Indices and OSA risk was assessed by a validated questionnaire only. According to American[26] and Australasian guidelines[27] overnight polysomnography is considered to be the gold standard for diagnosis of OSA. There is a scope to increase the measurement parameters taking into consideration radiological studies and other better assessment tools for OSA like polysomnography on a wider range and a bigger sample size. Undertaking more detailed studies in these lines can help the primary physician and the individual at risk to be able to calculate and predict the possibility of developing this condition.

Thus, the prediction of occurrence of the condition in a certain ethnic group can be foreseen. Further similar studies on a larger scale are warranted to cover more geographical area and correlate the findings to other studies.

Conclusion

Nasofacial anthropometry, conventional anthropometry along with body mass and ethnicity all have been found to have a role in the etiopathogenesis of the syndrome. Obstructive sleep apnea is a modifiable risk factor whose awareness can lead to early suspicion and diagnosis. If the population of Sikkim is made aware of the lurking threat in the society, detrimental conditions like hypertension, heart disease, metabolic disorders and neurogenic catastrophes can be avoided. Apart from the physical consequences social mishaps like dangerous driving can be controlled. Last but not the least; neuro cognitive improvement can enhance the work output and academic achievements of Sikkim and elsewhere.

Acknowledgment

We would like to thank ICMR (Indian Council Of Medical Research) for their invaluable support

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Annexure-I
Modified Berlin questionnaire (used at AIIMS, New Delhi)

***Category 1*:**
1. Do you snore?
   - Yes
   - No
   - Don't know

2. Your snoring is
   - Slightly louder than breathing
   - As loud as talking
   - Louder than talking
   - Very loud can be heard in adjacent rooms

3. How often do you snore?
   - Nearly every day
   - 3-4 times a wk
   - 1-2 times a wk
   - 1-2 times a month
   - Never or nearly never

4. Has your snoring ever bothered other people?
   - Yes
   - No

5. Has anyone noticed that you quit breathing during your sleep? If yes, how frequently?
   - Nearly every day
   - 3-4 times a wk
   - 1-2 times a wk
   - 1-2 times a month
   - Never or nearly never

6. Do you choke while you are sleeping? If yes, how frequently?
   - Nearly every day 3-4 times a wk
   - 1-2 times a wk
   - 1-2 times a month
   - Never or nearly never

***Category 2*:**
1. How often do your feel tired or fatigued after your sleep?
   - Nearly every day
   - 3-4 times a wk
   - 1-2 times a wk
   - 1-2 times a month
   - Never or nearly never

2. During your wake time do you feel tired, fatigued or not up to at par? If yes, how frequently?
   - Nearly every day
   - 3-4 times a wk
   - 1-2 times a wk
   - 1-2 times a month

Never or nearly never

3. Have you ever fallen asleep while waiting in a line to meet your doctor? If yes, how frequently?
   - Nearly in all visits
   - In 1-2 visits
   - In 3-4 visits
   - Never or nearly never

4. Have you ever fallen asleep while watching television at your home during daytime? If yes, how frequently?
   - Nearly every day
   - 3-4 times a wk
   - 1-2 times a wk
   - 1-2 times a month
   - Never or nearly never

5. Have you ever fallen asleep while waiting in a line to pay your electricity and telephone bills? If yes, how frequently?
   - Nearly every visit
   - In 3-4 visits
   - In 1-2 visits
   - Never or nearly never

***Category 3*:**

1. Do you have high blood pressure?
   - Yes
   - No
   - Don't know

Awareness section:

1. Do you know that chronic snoring may be a manifestation of a major health hazard?
   Yes/ No
2. Do you know that being sleepy always even after getting enough hours of sleep is not normal?
   Yes/ No
3. Do you know that being sleepy all the time and snoring can directly cause hypertension?
   Yes/ No
4. Do you know that this condition can result in increased risk of heart attack and Road Traffic Accidents?
   Yes/ No
5. Do you know that there is a treatment for snoring with excessive daytime sleepiness?
   Yes/ No