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Table of Contents

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Evaluation of the Impact of Tinnitus on Health-Related Quality of Life amid Sawmill Workforces

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Abstract

Background: Tinnitus is the phantom aural perception of sound lacking an exterior stimulus, a sub-type of auditory hallucination and it is a common sensation among noise-exposed employees. It is a symptom, not an illness. Tinnitus can be extremely perplexing for its subjects and it may perhaps disturb their health-related quality of life (HR-QoL) if exposed to extreme noises in many ways. **Objective:** This study is intended to discover the effects and pattern of tinnitus on health-related quality of life (HR-QoL) amid noise-exposed saw mill workforces. **Method:** This study was a prospective and public-centered cross-sectional study, including 510 sawmill personnel. 510 directorial staff was used as the control. Health-related quality of life (HR-QoL) of all subjects was assessed with the WHO Quality of Life brief questionnaire. Self-reported tinnitus morbidity was assessed by means of the Tinnitus Handicap Inventory. A correlation was established amid health-related quality of life scores and tinnitus severity scores. **Result:** There were 510 sawmill employees enlisted into the study, out of which 490 were men and 20 were women with control of the same age and sex. The mean age was 36.85 ± 7.68 years for the sawmill workers and 35.75 ± 8.65 years for the control group ($t = 1.02$, $P = 0.275$). The mean tinnitus score for the sawmill workers was 20.80 ± 2.56. Out of the 510 sawmill workers, 52 (10.2%) had tinnitus and one of the controls had tinnitus. The mean health-related quality of life scores were 62.20 ± 8.62 and 72.56 ± 5.98 for the sawmill workers and control group respectively. There was a substantial and remarkable difference between the health-related quality of life of the sawmill workers and the control group ($P < 0.05$). Also, it was

observed that there was a noteworthy drop in the overall physical and psychological domains of the health-related quality of life scores with an increase in work environment noise level among sawmill employees and no major alteration was observed in the social and environmental aspects of the quality of life scores with change in occupational noise gains. **Conclusion:** The prevalence of tinnitus from this study was found to be 10.20% and an upsurge in tinnitus rigorousness was seen to be related with a substantial drop in physical, psychological and social domains of the health related quality of life. We highly endorse hearing conservation programmes and use of personal protective equipments for sawmills workers which will aid to decrease the effects of exposure to loud noise. Those sawmill labors already having tinnitus must attempt to go for treatment.

Keywords

Tinnitus, Sawmill Workforces, Health-Related Quality of Life

1. Introduction

The word "tinnitus" is derived from the Latin word "tinnire" which means ringing [1]. It is an anomalous awareness of sounds deprived of an exterior stimulus [2]. Tinnitus has also been described as a phantom auditory perception or head noise [3] [4]. It differs in frequency and in its loudness (amplitude) and is typically designated as ringing, hissing, buzzing, and clicking sensation [5]. Tinnitus differs from classical aural hallucinations which usually occur in subjects with central nervous system illnesses, psychiatric ailments and alcoholism [6]. This is because unlike aural hallucination there is lack of organization of its content. This disorder might be present with or without hearing damage [7]. Tinnitus is believed to result from altered auditory firing rate, and cochlear damage affecting the myelin insulation and a neurophysiologic model has also been suggested [3] [8] [9].

Tinnitus may possibly be objective or subjective [10]. Some reasons for subjective tinnitus comprise wax impaction, otitis media, ototoxic drugs, presbyacusis, and tumors of the facial nerve (VII). Some reasons for objective tinnitus contain AV-malformations, palatal myoclonus, and glomus tumors. It is important to note that subjects of psychological tinnitus in which not at all a single organic origin is found have also been stated in the studies [11].

Researches have revealed that long-term exposure to loud sound could possibly be more vulnerable to tinnitus [12] [13]. Tinnitus frequently becomes a long-lasting and worrying symptom. Perceiving an abnormal sound moreover without an external stimulus could disturb sleep, the capability to concentrate on routine tasks, and performance and could possibly disturb the well-being of a person [14]. It could perhaps be as distressing as to the foundation of a range of psychosomatic ailments such as depression, mood glitches, emotional complications, and even suicidal endeavors. Hence, the objective of this study is to find

out the effects of tinnitus on health-related quality of life amid sawmill workforces as these employees are predominantly exposed to work-related occupational noise.

2. Materials and Methods

This is a prospective, population-based cross-sectional descriptive study involving sawmill workers in Ilorin. The data collection was done in October 2018 over a period of 15 days at the sawmill market, sawmill road and sawmill market at ASA Dam road in Ilorin, Kwara State. A sum of 510 sawmills workforces who agreed and matched the inclusion criteria was considered for the study. Inclusion criteria comprised all adult sawmill employees counting male and female from the age of 18 to 60 years who gave approval for the study. This was to conceivably eliminate background presbyacusis which could also cause sensorineural hearing loss (SNHL). Exclusion criteria counted in any history and examination indicative of active ear ailment at the time of enrolment, history indicative of earlier chronic ear diseases such as chronic suppurative otitis media, recurring episode of vertigo, history of head injury, chronic medical disorders such as diabetes mellitus, sickle cell disease, chronic use of ototoxic drugs such as Aminoglycoside antibiotics, loop diuretics, salicylates, cytotoxic drugs.

The health-related quality of life of all subjects was assessed with the World Health Organization Health-Related Quality of Life (WHO-HRQoL) brief questionnaire and a preformed noise exposure evaluation questionnaire. The WHO-QoL brief questionnaire adheres to the WHO's definition of health as "a state of the whole physical, mental and social well-being and not merely the absence of disease or infirmity". It assumes a multi-centric outline of health-related quality of life (HR-QoL), dividing it into four important domains: Physical health (7 items), psychological well-being (6 items), social relationships (3 items), and environmental factors (8 items). Two further things assess overall quality-of-life and self-rated health which is classified as terribly poor, poor, neither well nor poor, well and very well. Each item is scored on a 5-point scale, where an increase in the score corresponds to a better quality of life evaluation.

The sound gain at each sawmill region was recorded with a sound level meter (Pulsar model 14 type 2, meets the accuracy of IEC 61672-1 standard for sound pressure level—SPL) when the machines were in working mode. A pure tone audiometry (PTA) was performed with a screening audiometer (Ambco Model 1000 + P) and the hearing threshold was assessed using the pure tone average of the better ear.

Ethical approval was sought from our institutional committee. Data were analyzed using Statistical Package for Social Sciences version 20.0 and a "P" value of <0.05 was acknowledged as statistically substantial. Results were displayed in expressive format.

3. Results

There were 510 sawmill employees enlisted into the study out of which 490 were

men and 20 were women with control of same age and sex. The mean age was 36.85 ± 7.68 years for the sawmill workers and 35.75 ± 8.65 years for the control group (t = 1.02, P = 0.275). The mean tinnitus score for the sawmill workers was 20.80 ± 2.56. The severity of tinnitus is shown in Figure 1. The prevalence of tinnitus among the sawmill workers is 10.2% (Figure 2). Out of the 510 sawmill workers, 52 (10.2%) had tinnitus and one of the controls had tinnitus (Figure 3).

The mean health-related quality of life scores were 62.20 ± 8.62 and 72.56 ± 5.98 for the sawmill workers and control group respectively. There was a substantial and remarkable difference between the health-related quality of life of the sawmill workers and the control group ($P < 0.05$) as shown in Figure 3.

Table 1 shows that there was a noteworthy drop in the overall, physical and psychological domains of the health-related quality of life scores with an increase in work environment noise level among sawmill employees and no major alteration was observed in the social and environmental aspects of the quality of life scores with a change in occupational noise gains.

4. Discussion

The auditory awareness of sounds in the lack of a real outside sound can be

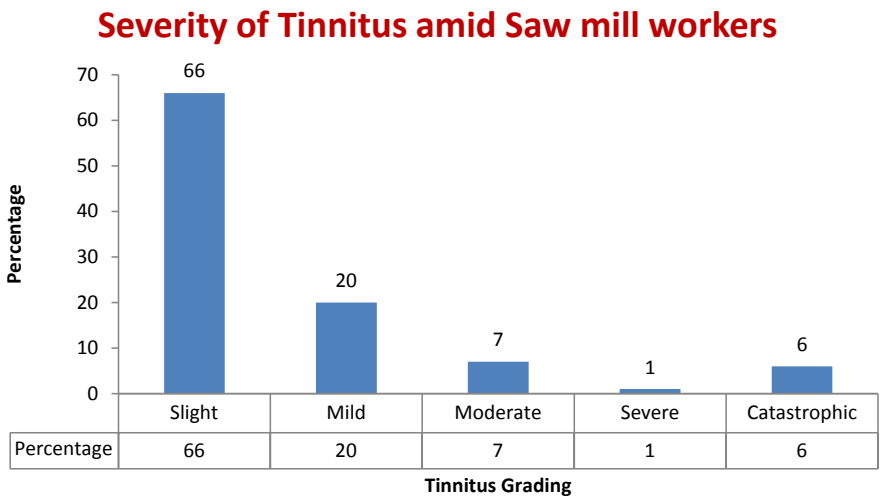


Figure 1. Severity of tinnitus amid sawmill workers.

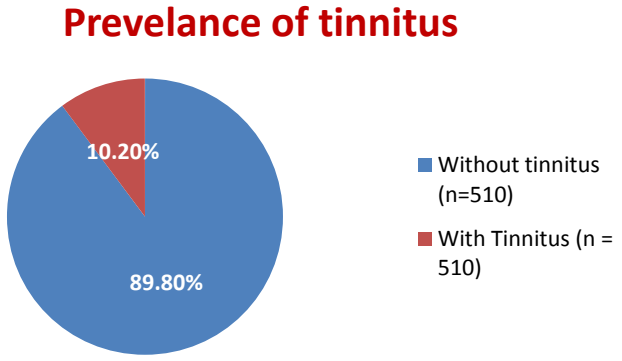
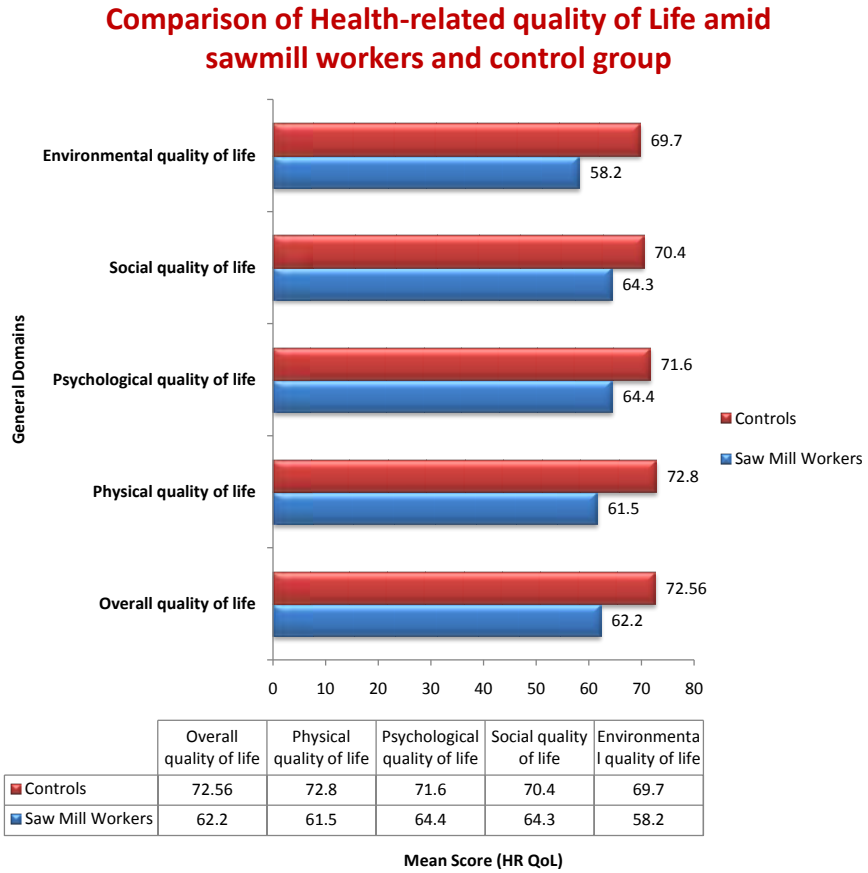


Figure 2. Showing prevalence of tinnitus.



	Overall quality of life	Physical quality of life	Psychological quality of life	Social quality of life	Environmental quality of life
Controls	72.56	72.8	71.6	70.4	69.7
Saw Mill Workers	62.2	61.5	64.4	64.3	58.2

Figure 3. Comparison of health-related quality of life amid sawmill workers and control group.

Table 1. P-values of the quality of life.

Variables	N	r	P Value
Overall quality of life and occupational noise	510	−0.181	0.012
Physical quality of life and occupational noise	510	−0.110	0.033
Psychological quality of life and occupational noise	510	−0.109	0.024
Social quality of life and occupational noise	510	−0.005	0.94
Environmental quality of life and occupational noise	510	−0.005	0.86

extremely upsetting to those who experience. It may be seen by others as a form of auditory hallucination which is, in reality, a different term as there is the absence of organization of its content [6]. Sawmill labors are predominantly susceptible as they are exposed to loud occupational noise for a lengthy period of the stretch. Majority of the workers are men as seen in this study. This may be due to the nature of the occupation which necessitates a lot of physical effort.

According to Axelsson and Prasher [15], noise contact is the most frequent causative factor of tinnitus. Tinnitus can cause a wide range of psychosomatic suffering which has the capability to subsequently affect health-related quality of life in numerous ways. The effects of symptom may well be psychosomatic, so-

cietal or corporal. This makes the WHO brief health-related quality of life questionnaire appropriate for this study. The health-related quality of life response of the participants was evaluated as psychological, social, physical and environmental according to the definition of health. Tinnitus being a subjective spectacle is very tough to measure and quantify objectively, hence its calculation in this study was done with a questionnaire to obtain values based on the response and description from the participants. The average tinnitus score among the sawmill workers was 20.8. This shows most of the workers had mild tinnitus. This level of tinnitus can affect sleep adversely which is a significant part of daily activity.

Though there is scarceness of comparative data on the level or grade of tinnitus amid sawmill labors, tinnitus is still known to affect physical happenings such as sleep, alertness, performance [16]. This study found that surge in tinnitus severity is associated with a reduction in the physical domain of the quality of life. Folmer and Griest [9] also stated that tinnitus could also be a reason for insomnia. Satisfactory sleep has been recognized as the key to sustaining daytime alertness which is essential for good performance [17]. This is predominantly important in the sawmill since the work is physically challenging. Meager performance has negative effects on health-related quality of life. Reduction in the physical aspect of quality of life which could possibly be in form of poor performance, sleep, alertness and this is very significant in the sawmill for good productivity. The upsurge inefficiency in the sawmills workers might pay to the nation-wide budget. Good performance and alertness in the sawmill workers could also help to reduce injuries among the workers as some of the possible injuries could be life-threatening.

Tinnitus rigorousness unfavorably affects the psychological and social domains of the health-related quality of life as perceived in this study. Awareness of abnormal sounds as in cases of tinnitus could affect some psychological variables such as depression, anxiety, and general well-being. Adoga [18] found that tinnitus could result in anxiety and depression. Also, Folmer *et al.* [19] found out that tinnitus severity positively correlated with measures of anxiety and depression. Sawmill workers need to be extremely stable psychologically to prevent unnecessary errors at work since they use heavy duty machines that require being careful to prevent physical casualties. Hence, the psychological consequence of tinnitus should never be overlooked. The effects of tinnitus also range on social life. This could possibly impact interactions within the workplace which is significant in preserving industrial harmony. Nevertheless, there was no significant connection between tinnitus severity and the environmental domain of health-related quality of life. There was additionally no noteworthy association amid tinnitus symptom rigorousness and overall health-related quality of life during this study. Teixeira *et al.* [20] and Roggerone [21] also observed no significant change in the quality of life among subjects with tinnitus. However, higher levels of health-related quality of life (good and very well) were reduced among sawmill workers when compared to the control. Tinnitus has therefore been shown to variously affect health-related quality of life adversely.

The limitations of the study are in the sample population and the fact that it is only two sawmill regions in the state that was used for the study.

5. Conclusions

The prevalence of tinnitus from this study was found to be 10.20% and an upsurge in tinnitus rigorousness was seen to be related with a substantial drop in physical, psychological and social domains of the health-related quality of life.

We endorse hearing conservation programmes and use of personal protective equipment for sawmills workers which will aid to decrease the effects of exposure to loud noise. Those sawmill labors already having tinnitus must attempt to go for treatment.

Acknowledgements

We wish to acknowledge the members of staff of the sawmill workers in Ilorin who participated and also made the study possible.

Ethical Consideration

The study was done in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration. The subjects gave their full consents for the study. The study protocol has been approved by the research institute's ethical and research committee of our institution.

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The research received no grants and was sponsored by the authors.

Author Contributions

Shuaib K. Aremu designed the study, obtained and analyzed the data and did the write-up. Waheed A. Adegbiji assisted in administering the questioner and literature review.

Conflicts of Interest

There are no conflicts of interest among the authors.

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Profile of Patients Treated in Outpatient Vestibular Rehabilitation at a Hospital in São Paulo

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Abstract

Introduction: Currently it is very common that the search for diagnosis and treatment for curing diseases can cause vertigo or dizziness. **Objective:** This study sought to characterize the profile of patients seen in the clinic for vestibular rehabilitation in a tertiary hospital in the last 10 years. **Methods:** Survey questionnaires of patients with dizziness. **Results:** The prevalence of treated subjects was female 65.3% (N = 439). The average age was 54.9 years old. Dizziness type roundabout was more prevalent 33.04% (N = 222). Tinnitus occurred in 58.33% of the population. The time of most observed dizziness was less than 5 years 70.68% (N = 475). Neurovegetative symptoms appeared in 63.98% (N = 430) of the population. The bilateral normal hearing was more standard 35.26% (N = 237). The topographic diagnosis of peripheral origin was the most usual 65.47% (N = 440). **Conclusion:** The peripheral otoneurologic involvement was more prevalent in this population, affecting more women at an average age of 54.9 years old. The most prevalent symptoms were vertigo, nausea, tachycardia, sweating, vomiting and tinnitus, characterizing the peripheral vestibular impairment. The time of dizziness was less than five years. Audiological standard normal curve was predominant and the symptom of tinnitus was the most reported. The most prevalent comorbidity was Hypertension.

Keywords

Dizziness, Epidemiology, Rehabilitation

1. Introduction

A dysfunction of the body balance is generated by a conflict in the integration of sensory information that helps postural control and that can be translated as dizziness [1] [2].

There are many symptoms associated with vertigo and other types of dizziness that can cause inability to perform of the professional, social and domestic activities triggering a series of psychosocial consequences [3]. Among them we have otoneurological symptoms (headache, hearing loss, ear pain, tinnitus and nausea) and psychological symptoms (depression, anxiety, and fear) [2] [4] [5].

Treatment of patients with vestibular dysfunction is an alarming problem. Vestibular dysfunctions are present in 5% to 10% of the world population and are the seventh complaint most commonly found in women and the fourth in men [6]. It is estimated that the prevalence of balance disorders and vertigo events is 5% to 10% of physician visits per year. In people over 65 years old dizziness is the first reason for a doctor's appointment [7].

Currently it is very common that the search for diagnosis and treatment for the cure of diseases can cause vertigo or dizziness; therefore, it is necessary that the characterization of this population should improve primary care, health promotion campaigns and specific advices. The purpose of this study was to obtain and describe the profile of the patients treated at the vestibular rehabilitation outpatient clinic in a tertiary-level hospital..

This study had the objective of obtaining and describing the profile of patients treated in vestibular rehabilitation clinic in a tertiary level hospital.

2. Methodology

2.1. Ethical Considerations

The study was approved by the Institutional Ethics Committee (Protocol No. 7277/2013).

2.2. Procedures

Data were collected through questionnaires completed in the initial consultation of the subject, by the responsible audiologist of the vestibular rehabilitation service.

The data collected were age, gender, otoneurological diagnosis, presence of vertigo and/or non-rotating, neurovegetative symptoms, auditory symptoms (tinnitus), hearing standard (result of audiometry), time of onset of dizziness, general health (metabolic disorders, vision problems, back problems, cranial trauma, hypertension, stroke and other) and the presence of vestibular tests.

2.3. Selection and Size of Sample

To obtain the profile of patients over 10 years of service in vestibular rehabilitation clinic in a tertiary level hospital were randomly selected questionnaires completed between the years 2002 to 2012. This was a retrospective, observational study.

Exclusion criteria: questionnaires with incomplete data; questionnaires filled out the described period.

2.4. Data Analysis

The descriptivestatistics for the data distribution and the coefficient of variation were performed.

3. Results

The sample consisted of 672 questionnaires. The distribution of subjects is by gender, mean age and standard deviation (Table 1).

About the type of dizziness presented, 33.04% (N = 222) of subjects had vertigo, 31.85% (N = 214) reported non-rotational dizziness and 35.11% (N = 236) of subjects reported having both types associated.

Figure 2 shows the distribution of subjects according to the presence of neurovegetative symptoms (nausea, vomiting, sweating, tachycardia and pallor) associated with dizziness (N = 672).

Figure 3 is the distribution of subjects for the presence of caloric testing in electronystagmography and computerized dynamic posturography.

4. Discussion

The distribution of the sample according to gender and average age (Table 1) shows the prevalence of dizziness in females agreeing to the world literature works [8] [9] [10] [11]. Women seek more medical care in relation to men and have factors such as variation of monthly hormonal cycle and the climacteric period which has dizziness as one of the main symptoms [12] [13].

Audiological results (Figure 1) indicate that most of the subjects had normal hearing bilaterally 35.26% (N = 237). We believe that the fact that the study population is not old, mean age 54.4 years and present mostly 65.47% (N = 440) peripheral topographic diagnosis where the most frequent labyrinth pathology is Benign Paroxysmal Positional Vertigo (BPPV) justified audiological research findings.

However, there was no a standard system of classification in results of audiological tests for degree classification of the hearing loss.

About the type of dizziness, more than half of the subjects 35.11% (N = 236) had vertigo and non-rotating dizziness associated.

About the presence of associated neurovegetative symptoms (Figure 2) such

Table 1. Distribution of subjects by gender, mean age and standard deviation.

Gender	N	%	Mean Age	Standard Deviation	Coefficient of Variation
Female	438	65.3%	54.07	16.95	31.34
Male	232	34.7%	55.28	17.20	31.11
Total	672	100%	54.99	17.05	31

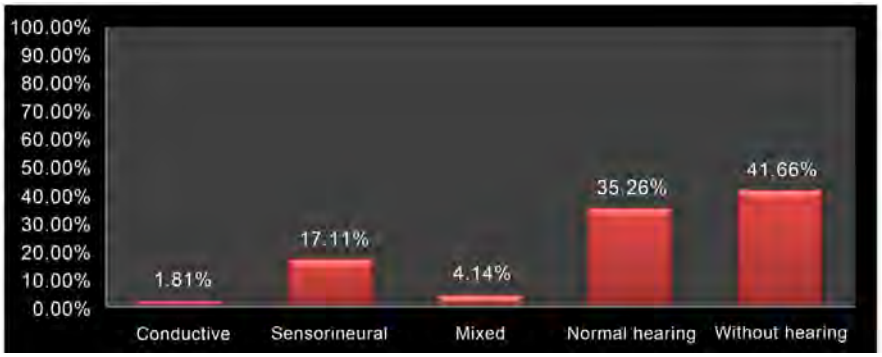

Figure 1. Distribution of subjects according to the type of hearing to the type of hearing loss.

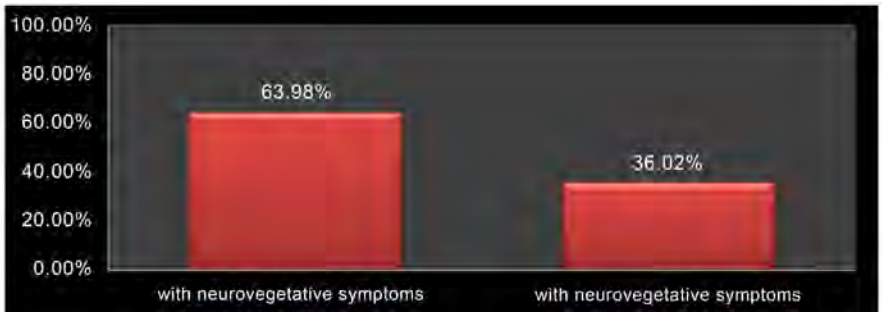

Figure 2. Distribution of subjects according to the complaint of neurovegetative symptoms.

as nausea, sweating, tachycardia and vomiting, most patients 63.68% (N = 428) had at least one of the symptoms mentioned in agreement with the study by Cohenetal. Describing these symptoms as frequently reported by patients with dizziness [14].

The tinnitus was hearing manifestation most commonly found in 58.33% (N = 392) of patients, according to the literature [15] [16].

There was a prevalence of 70.68% (N = 475) of the subjects of the sample with time corresponding dizziness complaint to a range of 0 to 5 years (**Table 2**) and this finding similar to that found in the study of Bittar *et al.* [12].

About the comorbidities found in this study (**Table 3**), were similar to those found in the works of Nishino *et al.* [8], Horunbia [17] and Fetter [18] that pointed as comorbidities of the dizziness, cardiovascular deficiency, metabolic disorders, cervical spine disorders, head or neck trauma, stroke, vision impairment, psychological disorders such as panic attacks and anxiety. The main comorbidity found in the study was hypertension 41.51% (N = 279) followed by a visual disorder 36.30% (N = 244).

About the presence of caloric test of Electronystagmography and Computerized Dynamic Posturography (**Figure 3**), the percentage of subjects without examination was 45.30% (N = 304) of the study population. It is believed that this was given obtained because the majority of the population studied have topographic diagnosis of peripheral origin, and the disease most commonly found is the Benign Paroxysmal Positional Vertigo, where the clinical examination set

Table 2. Distribution of subjects according to the time of dizziness.

Complaint Time	N	%
0 - 5 years	475	70.68
6 - 10 years	100	14.89
Over 10 years	97	14.43
Total	672	100

Table 3. Main comorbidities presented by the study population.

Comorbidity	N	%
Systemic arterial hypertension	279	41.51
Visual problems	244	36.30
Metabolic diseases	184	27.38
Migraine	82	12.20
Trauma cranial	74	11.01
Psychosocial problems	73	10.86
Spinal disorders	51	7.58
Stroke	34	5.05

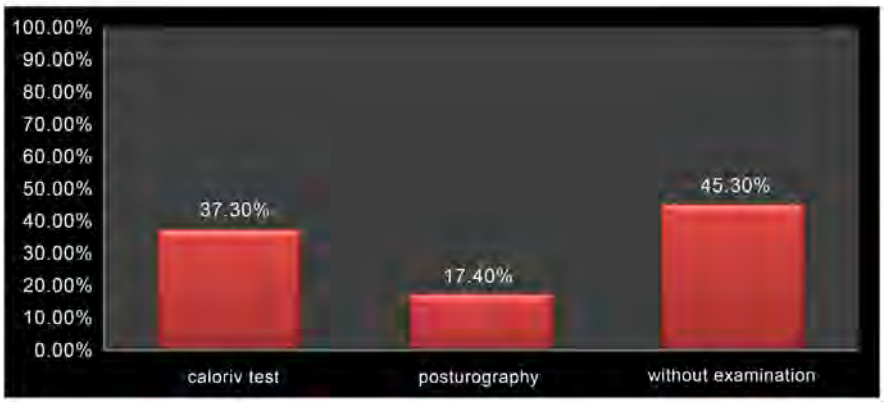

Figure 3. Distribution of subjects according to the presence of the test and posturography caloric test.

the indication of repositioning maneuvers and Vestibular Rehabilitation, even without the need for otoneurological additional tests [5].

About medical diagnosis (**Table 4**), much of the population studied 65.47% (N = 440) had some source of disease in the peripheral vestibular system as the cause of dizziness which corroborates the findings of Ganança *et al.* [5] and Ganança *et al.* [19] who estimated that the origin of dizziness is correlated with a peripheral system disorder in about 85% of cases.

5. Conclusion

The prevalence of gender in vestibular rehabilitation clinic was female. The average

Table 4. Distribution of subjects according to the topodiagnosis.

HD	N	%
Dizziness of peripheral origin	440	65.47
Dizziness of central origin	30	4.46
Dizziness clarify	202	30.05

age of the population served was 54.9 years old. Dizziness of the rotary type was the most prevalent. Tinnitus was the most commonly reported symptom oto-neurological. Nausea, pallor, sweating, tachycardia and vomiting have been associated with dizziness for 63.68% of the population. The most commonly reported complaint time was 0 - 5 years. The normal bilateral hearing was the predominant auditory pattern. The disorder of the peripheral vestibular system was the most prevalent. The Hypertension was the most commonly reported comorbidity.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Quality of Sleep among Pregnant Women

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Abstract

Objectives: The study aimed to describe the quality of sleep and explore factors especially Sleep Hygiene Practices associated with sleep quality among pregnant women. Study design: This is a cross-sectional study. Methods: 119 healthy pregnant women in two central hospitals in Vietnam were participated in this study. The Pittsburgh Sleep Quality Index (PSQI) was employed to evaluate sleep quality and the Modified Sleep Hygiene Practices was used to describe sleeping practices among pregnant women. Results: The results showed that while 58.8% pregnant women had quite good sleep quality, 41.2% of pregnant women had mild to moderate quality sleep disturbance. The quality of sleep was better in second trimester, but then getting worst in the third trimester. Multipara experienced worse sleep quality than nullipara. Poor sleep quality had a positive correlation with unhealthy Sleep Hygiene Practices including using an uncomfortable bed ($p < 0.05$), going to bed with variable bedtime ($p < 0.01$), watching TV or making call in bed other than sleep ($p < 0.05$), going to sleep without sleep sensation ($p < 0.001$) and staying in bed even though it was difficult to fall asleep ($p < 0.001$). Conclusion: Pregnant women should be taken care of on sleep quality, especially in the first and third trimester as they experience more change in hormone and physiology. Sleep Hygiene Practices should be emphasized in health education for pregnant women.

Keywords

Quality of Sleep, Pregnant Women

1. Introduction

Pregnant women experienced hormonal and physiological change that might be reasons for sleep disturbance. In 2007, National Sleep Foundation [1] reported that about 79% of pregnant women in the America suffered from sleep distur-

bance. It was reported that sleep alternation started with the first trimester and reached its maximum level by the third trimester. Facco *et al.* [2] found that poor sleep quality rose from 26% in the first trimester to 40% in the third trimester. Poor sleep quality could lead to some serious complications for both mothers and their babies. Pregnant women might suffer from stress, depression [3] and gestational diabetes [2] [4] [5]. The labor time could last longer; cesarean section delivery [6] [7] and preterm birth delivery [8] might occur. It was suggested that several factors could influence sleep quality of maternal health. These were maternal age [9] [10], pre-pregnancy body mass index (BMI) [10] [11], gestational age [12] [13], gravida (the number of pregnancy) [14] and para (the number of pregnancy beyond 20 weeks of gestation) [15]. In particular, Sleep Hygiene Practices have linked good effects on sleep quality according to some research studies [16] [17] [18]. In Vietnam, no research on quality of sleep among pregnant women was found. Therefore, the aim of this study was to describe sleep quality of pregnant women and explore factors especially Sleep Hygiene Practices associated with sleep quality.

2. Methods

This was a cross-sectional study. A convenient sample was chosen. 119 healthy pregnant women at obstetric clinic department in two central hospitals of Vietnam, from January to May 2018, were invited to participate in this study. The researchers met pregnant women at the obstetric clinic room, explained the research purpose and invited pregnant women to participate in the study. After signing the consent form, pregnant women were given their own time to complete the questionnaire. Each questionnaire required about 15 to 20 minutes to be finished. The study excluded the women who refused to answer the questionnaire.

The Vietnamese version of PSQI, translated and validated by the National Psychiatric Hospital of Vietnam [19], was used in this study. The PSQI has 18 self-report questions which included seven components: 1) Subjective sleep quality, 2) Sleep latency, 3) Sleep duration, 4) Habitual sleep efficiency, 5) Sleep disorder, 6) Sleeping medication use, and 7) Daytime dysfunction. Each component is scored from 0 to 3, thus, the total global score is 0 to 21, where higher scores indicating poorer quality of sleep. The PSQI was interpreted into 4 levels of sleep quality 1) good sleep quality (PSQI $\leq$ 5), 2) mild sleep quality disturbance (PSQI: 6 - 10), moderate sleep quality disturbance (PSQI: 11 - 15) and severe sleep quality disturbance (PSQI $\geq$ 16).

To explore the factors associated to sleep quality, Modified Sleep Hygiene Practices was used. This is a modified version from many original versions to measure sleep hygiene [18] [20] [21] [22]. Back translation procedure was employed to translate the Modified Sleep Hygiene Practices from English to Vietnamese. The scale consists self-rate 18 items including sleep habits, sleep environment, and eating or drinking habits prior to sleep. Participants are required

to indicate how frequently (always, frequently, sometimes, rarely, or never) they engage in specific behaviors. Each item is then coded with scores ranging from 5 (always) to 1 (never). A global score for sleep hygiene ranges from 18 to 90. Higher scores indicate worse sleep hygiene practices.

SPSS version 21 was used for data analysis. Descriptive analysis was used to present the characteristics of the participants. As the outcome variable (sleep quality) was not a normal distribution, non-parametric tests (Mann-Whitney U Test, Kruskal-Wallis Test, Spearman's rho correlation) were employed. All tests were two-tailed and $p < 0.05$ was considered significant.

The study was approved by the Hanoi Medical University, No. 4116.

3. Results

All of 119 pregnant women completed the questionnaire. Table 1 displays demographic and obstetric characteristics of participants. The mean of age was 27.82. 63.9% of them were employed. Most of women (75.6%) completed university educational level or higher. More than half of the women were with normal pre-pregnant BMI (58%). At the time of the survey, 57.1% of pregnant women were in their third trimester. 58.8% of pregnant women never had pregnant beyond 20 weeks of gestation (nullipara), which included 56.3% of pregnant women reported that this was the first time they have a pregnancy (primigravida). There were 12 cases reported of abortion/miscarriage in obstetric history.

The mean PSQI score was 5.38 ± 2.73, ranged from 1 to 15. More than half (58.8%) of pregnant women reported that they had good sleep quality. There were 37% of pregnant women had mild sleep quality disturbance and only 4.2% of the women experienced poor quality of sleep (Table 2). About three-fourths of participants slept more than 7 hours per night (75.6%) and had very high sleep efficiency (70.6%). There were 14.3% of pregnant women who needed more than 60 minutes to fall asleep. While 40.3% of the women reported that they experienced sleep disturbance from once to twice a week, no woman complained about this trouble for more than two times per week. Majority of the women experienced that they had no or less than once a week daytime dysfunction related to sleep at night (Table 3).

Bivariate analysis was used to examine the relationship between factors including age, pre-pregnancy BMI, occupation, education level, gestational age, gravida, para, and overall sleep hygiene practices (Table 4). The sleep quality was getting worse since the beginning of the first trimester compare to before pregnancy, then became better in the second trimester and got worse again in the third trimester, mean rank were 59.36, 44.44 and 66.18, respectively (Kruskal-Wallis Test, $p = 0.02$). We also found a significant difference in the quality of sleep among parity groups. The multipara group (pregnant women had two or more than two times of pregnancy beyond 20 week) had worse sleep quality than the nullipara group (pregnant women had never reached a pregnancy

Table 1. Demographic characteristics of pregnant women.

Variables	Number (N = 119)	Percentage (%)
Maternal age	Mean ± SD: 27.82 ± 3.97; Range: 19 - 40	
Pre-pregnancy BMI		
Underweight	33	27.7
Normal weight	69	58
Overweight/obese	17	14.3
	Mean ± SD: 20.07 ± 2.4; Range 13.89 - 30.47	
Occupational status		
Employment (officer, educator)	76	63.9
Self-employment (housewife, businessman)	28	23.5
Others	15	12.6
Education level		
Under university level	29	24.4
University level and higher	90	75.6
Marriage status		
Married	119	10
Single/divorced/widowed	0	0
Gestational age		
1st trimester (weeks 0 - 13)	25	21
2nd trimester (weeks 14 - 28)	26	21.8
3rd trimester (weeks ≥ 29)	68	57.1
		Mean ± SD: 27.34 ± 10.37
Gravida		
Primi-gravida[1]	67	56.3
Multi-gravida[2]	52	43.7
Parity		
Nullipara[3]	70	58.8
Primipara[4]	43	36.1
Multipara[5]	6	5
Abnormal obstetric history		
Abortion	12	10.1
Preterm delivery	5	4.2
Cesarean delivery	9	7.6

[1]First time of pregnancy; [2]Second or more than two times of pregnancy; [3]Never completed one pregnancy beyond 20 weeks; [4]Have completed one pregnancy beyond 20 weeks; [5]Have more than two pregnancy beyond 20 weeks.

beyond 20 weeks), mean rank were 92.42 and 56.32, respectively (Kruskal-Wallis Test, p = 0.04).

Table 2. Sleep quality among pregnant women.

Variables	N = 119	Percentage
Good (PSQI ≤ 5)	70	58.8
Mild sleep quality disturbance	44	37
Moderate sleep quality disturbance	5	4.2
Total PSQI: Mean ± SD: 5.38 ± 2.73, Range: 1 - 15		

Table 3. Frequency of the classification of sleep components.

Variables	Number (N = 119)	Percentage
Subjective sleep quality (pregnant women reported)		
Very good	9	7.6
Quite good	88	73.9
Quite bad	21	17.6
Very bad	1	0.8
Sleep latency—the time fall asleep (minutes)		
≤15	32	26.9
>15 and ≤30	41	35.4
>30 and ≤60	29	24.4
>60	17	14.3
	Mean ± SD: 25.25 ± 20.51	
Sleep duration (hours per night)		
≥7	90	75.6
<7 and ≥6	20	16.8
<6 and ≥5	7	5.9
<5	2	1.7
	Mean ± SD: 6.99 ± 0.93	
Habitual sleep efficiency (the time asleep over the total time in bed)		
Very high (≥85%)	84	70.6
Quite high (75% - 84%)	21	17.6
Quite low (65% - 74%)	12	10.1
Very low (≤64%)	2	1.7
	Mean ± SD: 89.84 ± 12.46	
Sleep disturbance (trouble sleep)		
No time a week	0	0
Less than once a week	71	59.7
Once or twice a week	48	40.3
Three or more times a week	0	1.7
Use of sleep medications		

Continued

Never	119	100
Daytime dysfunction		
No time a week	40	33.6
Less than once a week	60	50.4
Once or twice a week	18	15.1
Three or more times a week	1	0.8

Table 4. Bivariate analysis of factors that influence sleep quality.

Variables	Mean rank	Bi-variate analysis
Maternal age		$-0.07_{(Sp)}$
Pre-pregnancy BMI		
Underweight	64.94	
Normal weight	58.23	$0.96_{(Kr)}$
Overweight/obese	57.59	
Occupational status		
Employment	57.18	
Self-employment	60.41	$2.88_{(Kr)}$
Others	73.53	
Education level		
Under university level	50.44	$-1.1_{(M)}$
University level and higher	72	
Gestational age		
First trimester	59.36	
Second trimester	44.44	$7.64^{*}_{(Kr)}$
Third trimester	66.18	
Gravida groups		
Primigravida	56.49	$-1.28_{(M)}$
Multigavida	64.53	
Parity groups		
Nullipara	56.32	
Primipara	61.47	$6.3^{*}_{(Kr)}$
Multipara	92.42	
Overall sleep hygiene practices		$0.43^{***}_{(sp)}$

*$p < 0.05$; $_{(Sp)}$ Spearman's rho; $_{(Kr)}$ Kruskal-Wallis Test; $_{(M)}$ Mann-Whitney U Test.

Figure 1 showed the influence of unhealthy sleep hygiene practice to quality of sleep including using an uncomfortable bed ($p < 0.05$), going to bed with variable bedtime ($p < 0.01$), watching TV or making call in bed other than sleep (p

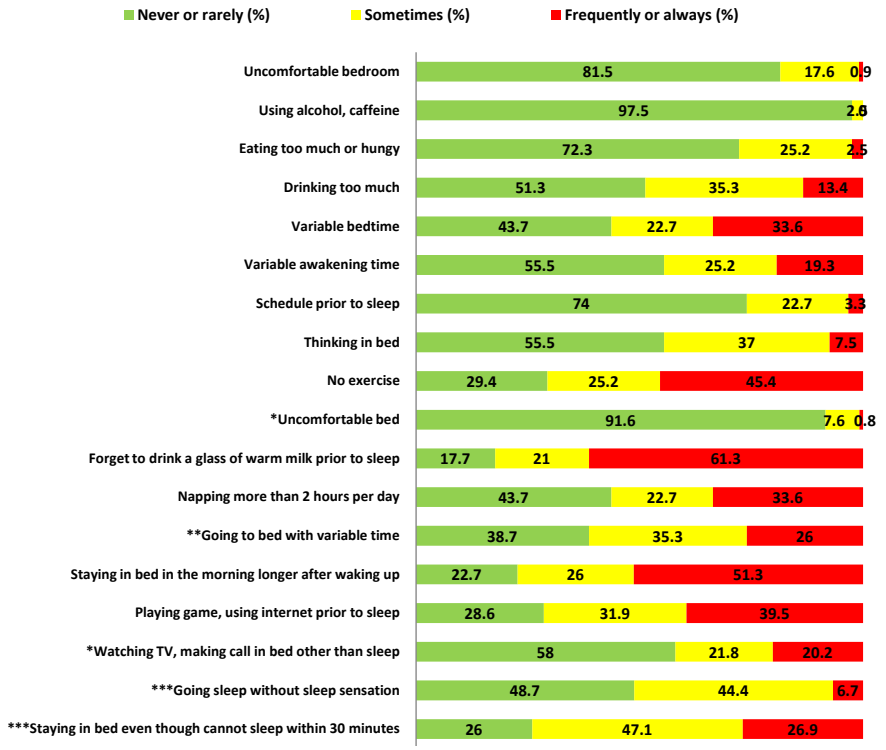

Figure 1. Sleep Hygiene Practices and its association with sleep quality.

< 0.05), going to sleep without sleep sensation ($p < 0.001$) and staying in bed even though it is difficult to fall asleep ($p < 0.001$). Spearman's rho correlation showed a positive moderate correlation between overall sleep hygiene practices and sleep quality ($r_s = 0.43$, $p < 0.001$).

4. Discussion

Our study found that generally pregnant women had good sleep quality, the mean PSQI was 5.38 ± 2.73. According to a study conducted in Taiwan [23] and in Iran [18], the quality of sleep among pregnant women (the mean score PSQI was 7.25 ± 3.43 and 8.58 ± 2.55, respectively) was slightly poorer than that of Vietnamese women in our study. This difference may be explained as only healthy pregnant women were included in our study.

In our study, younger mothers were more likely to have better quality of sleep ($r_s = -0.07$). This trend was similar to a study conducted by Taskiran [9], showing that women aged between 29 and 45 year old had worse sleep quality than the age group between 17 and 28. However, as the sample size of our study was quite small, this difference might not reveal as significant.

Our study found the statistically significant correlation between gestational age and sleep quality. Facco *et al.* [12] also found that pregnant women experienced worse sleep quality in the first trimester; it became better in the second trimester and then getting worse again in the third trimester. The reasons could be due to increasing hormones (estrogen and progesterone) started in the first trimester and reached the peak in the third trimester. Physiological change such

as tender breast, enlarge uterus also reached the largest in the third trimester [24].

Women who experienced pregnancy for the first time might have worse sleep quality likely because of concerns about baby care [14] [15]. In our study, the relationship between the number of pregnancies (gravida) and sleep quality was not found. However, we found a statistical significant difference between sleep quality and parity (the number of pregnancies reaching 20 weeks of gestation), which indicated that multipara had worse sleep quality than nullipara. We could not find any evidence in our limited literature to explain for the reason that the number of pregnancy beyond 20 weeks could affect the quality of sleep among pregnant women.

Sleep quality could be affected by poor Sleep Hygiene Practices, including uncomfortable bed, variable bedtime, using the bed for other activities, going to bed without sensation and staying in bed even though cannot sleep within 30 minutes. Our results showed positive correlations between sleep quality and Sleep Hygiene Practices that were consistent with literature [16] [17] [18].

5. Limitation

The study was conducted in a short time, with a convenient sample and a small sample size thus the finding may not be used for generalization. Some information requires participants to recall that could lead to recall bias.

6. Conclusion

Pregnant women should be taken care of on sleep quality, especially in the first and third trimester as they experience more change in hormone and physiology. Sleep Hygiene Practices should be emphasized in health education for pregnant women including: using a comfortable bed, not going to bed with variable bedtime, should not watch TV or make call at bed time, not going to sleep without sleep sensation, and should not stay in bed if it is difficult to fall asleep.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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