

Effect of Sleep Hygiene Program on Sleep Quality, Depression, Anxiety and Stress among Resident Older Adults

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Abstract:

Background: Sleep problems are prevalent among older adults; therefore sleep hygiene approach used to promote healthy sleep, improve quality of sleep and keep healthy sleep habits.

Aim of the study: to evaluate effect of sleep hygiene program on sleep quality, depression, anxiety and stress among resident older adults health in Port Said city.

Design: A quasi-experimental with pre-posttest research design was used in the study.

Setting: The study was carried in geriatric home in Port Said city.

Sample: The study Sample consists of 71 older adults.

Tools: Four tools were utilized in the current study; structured interview questionnaire, Sleep Hygiene Index (SHI), The Pittsburgh Sleep Quality Index (PSQI) and Depression, Anxiety and Stress Scale (DASS-21).

Results: There was statistically significant improvements in total sleep hygiene index (SHI) and PSQI global score after program implementation; meanwhile there was no statistically significant improvement in depression, anxiety and stress scale (DASS-21) after program implementation. There was statistically significant positive correlation between sleep hygiene index, sleep quality, depression, anxiety and stress scale (DASS-21).

Conclusion: Sleep hygiene program was successful in improving SHI and PSQI scores meanwhile (DASS-21) wasn't improved.

Recommendations: application of sleep hygiene programs on a long term base for elderly in geriatric home.

Keywords: Sleep Hygiene, Sleep Quality, Depression, Anxiety, Stress, Older Adults.

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I. Introduction

Sleep is a necessity need for human growth and development .It consider a serious processes to optimize a good quality of life, maintain physical and mental functioning (Lee, Paek & Han, 2015). Sleep is a basic part of people life without sleep the body cannot functionally well, the right amount of sleep helps to maintain power for daily tasks. During sleep the body repairs itself, strengthens learning, memories and reclaims its chemical harmony (Watson & Cherney, 2020).

Aging is a global phenomenon, the world's population aged 60 or over is estimated to reach 2 billion in the world (22% of the total population) by 2050 (World Health Organization, 2017). In Egypt, statistics on elderly showed that number of older persons was 6.5 million (3.5 million male & 3 million female) represent 6.7% of total population (6.9% male and 6.4% female)(Central Agency for Public Mobilization and Statistics [CAPMAS], 2019). There were significant changes in sleep patterns associated with aging which include both qualitative and quantitative changes. Different studies reported that there is decrease in total sleep duration with aging (Suzuki, Miyamoto & Hirata, 2017).

Older adults are commonly reported sleep problems, sleep fragmentation and early morning waking than younger counterparts and thus reflected on sleep quality and exaggerated daytime sleepiness (Gleason & McCall, 2015; Rodriguez, Dzierzewski & Alessi, 2015). Older adults need to sleep seven to nine hours in night regrettably, many of them often get lesser sleep than they require (Dahlkemper, 2019). Disruptions in the sleep-wake cycle, duration of sleep, or sleep quality are associated with potentially severe negative consequences on physical and mental health (Seun-Fadipe & Mosaku, 2017).

Sleep inadequacy had tremendous impact on older adults in many respects such as poor concentration, delayed response time, elevated the risk of falling, attention and memory deterioration (Abraham, Pu, Schleiden, & Albert, 2017). Sleep deprivation and impaired sleep quality also, had great impact on activities of daily living, decreased ability to accomplish tasks, elderly health and social consequences (Hershner & Chervin, 2014). Add to that mental and physical problems, diminished energy levels, and increased level of anxiety or depression (Ozdemir, Boysan, Selvi, Yildirim, & Yilmaz, 2015).

Sleep hygiene is common a non-pharmacological approach commonly used to improve sleep quality (Saeedi,Shamsikhani,Farahani&Haghverdi ,2014).Sleep hygiene approaches refers to behavioral intervention where in person are provided instructions about healthy sleep habits during the day and at night to improve the level and quality of sleep. (Ngante, 2016).Sleep hygiene recommend series practice of healthy habits that promote good sleep such as ensure adequate daily exercising, maintain a healthy diet intake, comfortable sleep environment such as bedding ,light , noise minimization and establishing a regular relaxing bedtime routine (Posner& Gehrman,2011). In addition to stimulants avoidance in the late afternoon or evening as caffeine and nicotine, limit alcohol consumption and decrease fluid intake around bedtime (Singer & Nanda, 2010).

A nursing home is an alternative home of residence for older people who need assistance with their activities of daily living. Many institutions are providing dwelling arrangements with a home-like environment in contrast with the environment of a healthcare facility (Rijnaard et al 2016). Sleep problems are more common among resident older adults in nursing homes rather than community living dwellingsbecause they suffer from highly sleep disturbance as result of inactivity, spent extra time in bed, insufficient light exposure and reduced sleep hygiene (Neikrug, &Ancoli-Israel, 2010).

Educating older adult is the cornerstone role of nurse to prevent poor sleep hygiene .Encourage them to have regular daily schedule for sleep and wake times, sleep seven hours in night, avoid strenuous activities before bedtime, exposure for sunlight during the day, and inhibit day time napping. At bedtime limit caffeine and tobacco consumption, have warm bath, use the bed only for sleeping, and avoid heavy meal (AGS, 2017).

Significance of the study

Sleep pattern changes are more common at age sixty years. Elder are more vulnerable to sleep disturbances and sleep complaints are the most prevalent (Miner&Kryger, 2017). It is reported that 50% of elderly suffer from sleep in adequacy and sleep difficulties at night (Crowley, 2011). In recent reviews reports, 40-70% of elder have constant sleep problems, and more than 50% of them are unknown cases. Additionally during clinical training for faculty student in geriatric home, it was found that the majority of elder complains were different sleep problems also, a recent master study conducted by (AbdAllah,Shafik&Abd Elkhalik,2019) to assess sleep quality among elderly in port said city found that most of elderly had poor sleep quality .Therefore, to bridge the gap and providing an effective practical approach to improve sleep problems, sleep hygiene program was implemented to enhance sleep hygienic practice, sleep quality, and improve depression, anxiety and stress. Studies show that the use of sleep hygiene is useful to promote better sleep and decline sleep impairment (Irwin, Olmstead, &Motivala, 2008).From here; the current study evaluate effect of sleep hygiene program on sleep quality, depression, anxiety and stress among resident older adultsin Port Said city.

Aim of the Study:

The study aims to evaluate effect of sleep hygiene program on sleep quality, depression, anxiety and stress among resident older adults in Port Said city.

Such aim attained through the following objectives

1. Assess sleep hygiene index, sleep quality, depression, anxiety and stress scale (DASS-21) of resident older adults.
2. Develop and implement sleep hygiene program to improve sleep hygiene, sleep quality, depression, anxiety and stress among resident older adults.
3. Examine effect of sleep hygiene program on resident older adults sleep quality, depression, anxiety and stress.

Research Hypothesis:

Implementing sleep hygiene program will improve resident older adults sleep hygiene, sleep quality, depression, anxiety and stress level.

II. Methods

2.1. Research Design:

A quasi- experimental research design was used in this study to accomplish study aim.

2.2 .Study setting:

The present study was implemented in all geriatric home affiliated in Port Said city .The first geriatric home namely Muslims Mabra for elderly which located in Elarab district and composed of two buildings Dar Al-Hananfree residence and Dar Al-Takreem paid residence each building composed of two floors. The second geriatric home in Port Said city named Dar Mubarak elderly home which located in Port foudad district and consist of four floors.

2.3. Subjects:

Older adults of both sex residing in previous setting and who attained the following criteria aged 60 years and above, had daytime problems due to poor sleep, as exaggerated daytime sleepiness, fatigue, anxiety and lack of concentration, able to communicate and comprehend effectively, agree to participate in the study and free from psychiatric disorders and dementia. The study sample comprised of 71 elderly (45 in Muslims Mabra and 26 in Dar Mubarak).

2.4. TOOL OF DATA COLLECTION: *The researcher used the following tools to collect the data:*

TOOL (I):

The first tool was an interview questionnaire. It was used to assess socio demographic data of the studied older adult. It was developed by the researcher. It contains two parts:

Part 1: Sociodemographic characteristics of the studied elders

It includes sex, age, level of education, marital status, job, room residence, income and current income source

Part 2: Health history of the studied elders:

It includes questions about health history of the studied elders such as medical health history of chronic diseases as; hypertension, diabetes mellitus, cardiac diseases, renal diseases, chest diseases and gastro intestinal diseases...etc. and number of chronic diseases. As well as on regular medications, medication side effects, smoking, daytime problems due to poor sleep, such as exaggerated daytime sleepiness, fatigue, anxiety, weak performance and lack of concentration.

TOOL (II):

The second tool was sleep hygiene index (SHI). It was used to evaluate environment and sleep disturbing behavior among elderly. It was developed by (**Mastin, Bryson & Corwyn, 2006**). Sleep hygiene index consists of 13 items which indicate how frequently studied elderly engage in specific behaviors. It utilized 5-point likert scale as follow: 0,1,2,3 and 4 for the response never, rarely, sometimes frequently and always. The scale was translated into Arabic and tested for the content validity by a jury of 7 experts in field of community health nursing, family and community medicine, the required corrections and modifications were carried out accordingly. Total score for sleep hygiene index range from zero to 52. Higher score representing poor sleep hygiene status.

TOOL (III):

The third tool was The Pittsburgh Sleep Quality Index (PSQI) .It was utilized to assess quality of sleep and sleep disturbances over one month period. It was developed by (**Buysse et al., 1989**) .An Arabic version of The PSQI was utilized in this study designed by (**Suleiman et al. 2010**). It consists of 19-item self-report questionnaire and comprised of seven-subscale as follows:

- Sleep quality: this subscale include 1 item .(item number 6)
- Sleep latency : this subscale include 2 items .(item number 2 and 5a)
- Sleep duration: this subscale include 1 item .(item number 4)
- Habitual sleep efficiency(sleep entry) : this subscale include 3 item .(items number 1, 3 and 4)
- Sleep disturbances : this subscale include 9 items .(item from 5b to 5j)
- Sleep medications: this subscale include 1 item .(item number 7)
- Daytime dysfunction : this subscale include 2 items .(items number 8 and 9)

It utilized 4 point likert scale rated on 0-3 scale with 0 denoting no difficulty and 3 point to severe difficulty. Global scores ranges from 0 to 21 with the higher scores revealed poor sleep quality. Poor sleep was considered at a score 5 or higher according to tool instructions.

TOOL (IV):

The fourth tool was Depression, Anxiety and Stress Scale (DASS-21). It is self-report tool used to assess depression, anxiety and stress among resident older adult. It was developed by **Lovibond, & Lovibond (1995)**. An Arabic version of (DASS-21) was utilized in current study. The DASS-21 has 21 items in 3 subscales: depression, anxiety and stress scale. Each subscales of depression, anxiety and stress composed of 7 items. Response options are on scale from 0 (do not apply to me at all) to 3 (applies to me very much). Scores are summed by adding up the items for each subscale and multiplying them by a factor 2. Sum scores for the total DASS-total scale thus range between 0 and 120, and those for each of the subscales may range between 0 and 42. Cut-off scores were applied according to tool instructions. Higher scores reflect psychological distress.

2.5. Validity

Study tools were judged by seven experts in the field of community health nursing, family and community medicine to evaluate its content validity. Based on expert recommendations the required modifications were done.

2.6. Reliability

The reliability was assured by Cronbach's Alpha coefficient test which indicated that study tools are reliable as follow values (Cronbach's Alpha =0.71 for SHI, 0.86 for PSQI and 0.90 for DASS-21).

2.7. Pilot Study:

A pilot study was carried out on 10 percent of older adults to test the tools before starting data collection, test the applicability, clarify feasibility and to estimate the approximate time needed to fill the tools. The necessary modifications were done and the sheets were put in the final form. The time needed for completion questionnaire sheet ranged between 15-20 minutes. Pilot study subjects weren't included in the main study sample.

2.8. Fieldwork:

After obtaining the official approval, the researcher explains the study aim to elderly in a simple way; the consent was obtained before elder participation in the study. Data was collected through period from 24 August 2019 to 30 November 2019, three days per week from 9:00 Am to 1:30 Pm. The study was divided in to four phases.

Phase (1): Assessment

Before starting up program design and planning, the researcher reviewed different relevant literature and prepare pre-intervention questionnaire for baseline assessment. Assessment data provide the base for building-up the program according to identified needs.

Phase (2): Planning

Sleep hygiene program was directed to older adults to improve their sleep hygiene practice, quality of sleep and their DASS. Objectives were settled to include general knowledge of sleep as definition of sleep, its benefits, barriers, good quality of sleep and its hygienic practice. Different teaching aids had been used as slide show and booklet .Booklet was developed by the researcher to be an educational aid throughout the intervention. The plan of was formulated as regard the number of sessions.

Phase (3): Implementation

The researcher attended geriatric home from 9 AM to 1:30 PM three days according to arrangement with older adults. They were divided into small groups each group consisted of approximately 10-12 elder. The researcher meets two groups per day. Sleep hygiene program was composed of 6 sessions over a period of 6 weeks. First and second sessions focused on benefits of sleep, elderly sleep hour's needs, and consequences of insufficient sleep on physical and mental health. The third session focused on prevalent sleep disorders, its factors, sleep medications and sleep quality. The main focus of fourth, fifth and sixth sessions was educating elder about sleep hygiene as the avoidance of caffeine , nicotine, heavy meal, aggressive exercise before bed-time and minimization of noise, light, bed should use only for sleep, have a warm shower to promote relaxation, and form a daily fixed schedule for waking up. Session length varied based on elderly's respond, activities required in each session to be achieved and their active participation. Each session started with summary of previous session then modified lecture using power point pictures followed by discussion. The program was presented in clear, concise form and using different teaching methods.

Phase (4): Evaluation

After program implementation, evaluation was done immediately by the end of the intervention (post-test).

2.9. Administrative design

An official approval to conduct the study was taken from faculty of nursing, Port Said University to the manager of geriatric home, to ensure elders cooperation and permission after an explanation of purpose and objectives of the study.

2.10. Ethical Consideration:

Ethical considerations was assured through the study .The researcher explained the aim of the study to every elder before participation, voluntary consent was obtained from each elder ,emphasized the right to withdraw without any consequences and providing help when needed. Confirming that information obtained is kept confidential and private.

2.11. Statistical analysis

Data analyzed using SPSS 20.0 statistical software package. Qualitative variables were presented in form of frequencies and percentages while quantitative variables in means and standard deviations forms. The tests utilized in study are t-test to compare between two independent groups while paired t-test applied for dependent groups, also Mann-Whitney, Kruskal-Wallis tests and ANOVA were used. Chi-square test point to compare categorical variables ,it couldn't be tested in greater than 2x2 cross-tables when the normal value in 10% or more of the cells was less than 5. Spearman appraises the inter-relationships and multiple linear regressions to analyze the independent predictors of the scores. Significance adopted when p-value <0.05.

III. Result

Table (1):clarifies that 56.3% of elderly are males, lower than three-fourths (70.4%) of the studied elderly aged less than 70 years with mean 67.8±5.7 and 45.1% of elderly aren't educated. Only 9.9% of them were single, almost all of them (95.8%) aren't currently working, and 56.3% were living in shared room. Finally 66.2% had sufficient income and retirement pension was the prime source of income for 81.7% of elderly.

Regarding studied elderly medical data **Table (2)** shows that 88.7% of elderly had chronic diseases, mainly hypertension and diabetes (69 % and 47.9%) respectively. Most of studied elderly (90.1%) are taking regular medications and one third of them (31.3%) had medications side effect and 80.3% are non-smoker. As regard day time problems caused by inadequate sleep more than half (53.5 %) suffer from day time sleepiness and 43.7 % had lack of concentration.

Table (3): indicates that there was statistical significant improvement in elderly's total sleep hygiene index post-intervention (P=0.04).

Concerning Pittsburgh sleep quality index (PSQI) **Table (4)** shows that there was statistically significant improvements in elderly total PSQI scores post-intervention (P=0.01).

As regard depression, anxiety, and stress (DASS-21) **Table (5)** shows no statistical significant improvement in depression, anxiety, and stress level among elderly post-program implementation.

Table (6) shows statistically significant positive correlation between SHI scores, PSQI scores, anxiety, depression and stress.

Table (7) reports statistical significant negative correlation between education level and SHI scores (p= -.235), depression (p= -.264) and stress (p= -.275).

As regard multiple linear regression models for SHI scores **Table (8)** revealed that variables as intervention, age, working and private room were significant predictor for SHI scores. Intervention, age, working and private room decrease SHI scores as follow (B =-1.89, -0.22, -5.01& -3.96 respectively), meanwhile female gender and smoking are positively increase SHI scores (B = 2.58 &2.66 respectively).

As regard multiple linear regression models for PSQI scores**Table (9)** revealed that intervention and private room were significant predictor for PSQI scores, as it decrease PSQI scores as follow (B =-1.30&-1.60respectively), meanwhile insufficient income increasePSQI scores(B =1.44).

Table 1: Distribution of studied elder according to socio-demographic characteristics (n=71)

Items	No.	%
Hospice:		
Mubarak	26	36.6
Alhanan	23	32.4
Altakrim	22	31.0
Sex:		
Male	40	56.3
Female	31	43.7
Age:		
<70	50	70.4
70+	21	29.6
Range	61.0-86.0	
Mean±SD	67.8±5.7	
Median	66.0	
Education:		
None	32	45.1
Basic/intermediate	27	38.0
University	12	16.9
Marital status:		

Single	7	9.9
Divorced/widow	64	90.1
Job:		
None	68	95.8
Working	3	4.2
Room:		
Private	31	43.7
shared	40	56.3
Income:		
Sufficient	47	66.2
Insufficient	24	33.8
Source of income:		
Pension	58	81.7
Multiple	13	18.3

Table 2: Distribution of studied elderly as regard medical data (n=71)

Items	No.	%
Chronic diseases:		
No	8	11.3
Yes	63	88.7
Diseases:@		
Hypertension	49	69.0
Diabetes	34	47.9
Cardiac	15	21.1
Chest	8	11.3
Renal	7	9.9
Liver/GIT	7	9.9
Endocrine	2	2.8
Male problems	2	2.8
Number of diseases:		
Range	0-5	
Mean±SD	2.1±1.2	
Median	2.0	
On regular medication:		
No	7	9.9
Yes	64	90.1
Number of medications:		
Range	2-10	
Mean±SD	3.9±2.0	
Median	3.0	
Medication side effects:		
No	44	68.8
Yes	20	31.3
Smoking		
No	57	80.3
Yes	14	19.7
Daytime problems:@		
Daytime sleepiness	38	53.5
Lack of concentration	31	43.7
Fatigue	20	28.2
Weak performance	14	19.7
Anxiety	5	7.0
Number of daytime problems:		
Range	0-5	
Mean±SD	1.5±1.1	
Median	1.0	

@responses is not mutually exclusive

Table 3: Sleep Hygiene Index (SHI) among studied elderly in the study sample pre and post intervention

SHI	Pre (n=71)		Post (n=71)		Mann-Whitney Test	P-value
	Mean±SD	Median	Mean±SD	Median		
▪ Sleep disturbing behavior and environment	8.8±3.2	9.00	8.0±3.0	8.00	2.69	0.10
▪ Irregular sleep-wake schedule	10.8±4.3	11.00	9.7±3.4	9.00	2.12	0.15
Total SHI	19.6±6.0	20.00	17.7±5.4	17.00	4.17	0.04*

(*) Statistically significant at p<0.05

Table 4: Pittsburgh Sleep Quality Index (PSQI) among studied elderly in the study sample pre and post intervention

Items	Pre (n=71)		Post (n=71)		Mann-Whitney Test	p-value
	Mean±SD	Median	Mean±SD	Median		
Bed time (pm)		21.00		22.00	0.08	0.78
Sleep entry (min)	38.7±35.8	30.00	28.4±26.0	20.00	2.59	0.11
Wakeup time (am)	7.7±2.2	8.00	7.8±2.1	8.00	0.01	0.94
Sleep duration (hrs)	5.7±1.3	6.00	5.8±1.2	6.00	0.09	0.77
PSQI scores:						
Sleep entry	1.2±1.1	1.00	0.8±0.9	1.00	3.75	0.053
Sleep duration	0.4±0.7	0.00	0.2±0.5	0.00	2.90	0.09
Sleep disturbance	1.3±0.5	1.00	1.0±0.4	1.00	12.65	<0.001*
Overall quality	1.3±0.9	1.00	1.5±0.8	2.00	2.09	0.15
Sleep latency	1.5±0.7	1.00	1.3±0.5	1.00	5.84	0.02*
Sleep pills	0.6±1.1	0.00	0.4±0.9	0.00	0.50	0.48
Day dysfunction	1.7±1.0	2.00	1.4±0.9	1.00	3.07	0.08
Total PSQI	7.9±3.4	7.00	6.6±2.7	6.00	6.00	0.01*

(*) Statistically significant at $p < 0.05$

Table 5: Depression, anxiety and stress scale (DASS-21) among studied elderly before and after intervention.

Items	Pre (n=71)		Post (n=71)		Mann-Whitney Test	p-value
	Mean±SD	Median	Mean±SD	Median		
Depression	9.3±5.4	8.00	8.6±4.6	8.00	0.56	0.45
Anxiety	8.1±5.5	7.00	7.8±4.8	7.00	0.04	0.85
Stress	9.2±5.2	9.00	9.2±4.5	8.00	0.01	0.91

Table 6: Correlation matrix of elderly post-pre differences in scores of SHI, PSQI, Depression, Anxiety and Stress Scale (DASS-21)

Post-pre score Difference	Spearman's rank correlation coefficient				
	SHI	PSQI	Anxiety	Depression	Stress
SHI					
PSQI	.420**				
Anxiety	.466**	.381**			
Depression	.585**	.505**	.588**		
Stress	.443**	.286*	.431**	.585**	

(*) Statistically significant at $p < 0.05$

(**) statistically significant at $p < 0.01$

Table 7: Correlation matrix of elderly post-pre differences in scores of SHI, PSQI, DASS-21 and their characteristics

Elderly characteristics	Spearman's rank correlation coefficient				
	SHI	PSQI	Anxiety	Depression	Stress
Age	.231	.031	-.084	.069	.163
Education level	-.235*	-.231	-.117	-.264*	-.275*
Income	-.071	.113	-.113	-.052	-.015
No. of diseases	-.101	-.136	-.224	-.113	-.088
No. of medications	.002	.030	-.127	-.029	-.060

(*) Statistically significant at $p < 0.05$

(**) statistically significant at $p < 0.01$

Table 8: Linear regression analysis for the SHI score

variables	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	38.53	6.01		6.407	0.000	26.64	50.42
Intervention	-1.89	0.85	-0.16	-2.222	0.028	-3.57	-0.21
Female gender	2.58	0.94	0.22	2.749	0.007	0.72	4.44
Age	-0.22	0.08	-0.22	-2.859	0.005	-0.37	-0.07
Working	-5.01	2.16	-0.18	-2.315	0.022	-9.29	-0.73

Private room	-3.96	0.87	-0.34	-4.532	<0.001	-5.70	-2.23
Smoking	2.66	1.16	0.18	2.288	0.024	0.36	4.96

r-square=0.26
 Model ANOVA: F=7.83, p<0.001
 Variables entered and excluded: marital status, education, income, chronic diseases, hospice

Table 9: linear regression model for the PSQI score

variables	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	9.77	1.17		8.351	<0.001	7.46	12.08
Intervention	-1.30	0.49	-0.21	-2.624	0.010	-2.27	-0.32
Private room	-1.60	0.56	-0.26	-2.867	0.005	-2.70	-0.50
Insufficient income	1.44	0.58	0.22	2.463	0.015	0.28	2.59

r-square=0.10
 Model ANOVA: F=5.61, p=0.001
 Variables entered and excluded: age, sex, marital status, education, smoking, job, chronic diseases, hospice

IV. Discussion

One-third of person life spent in sleeping. Sleep consider crucial to maintain health, keep functioning of older adults daily life activities in addition to maintain physically well **Hoffman (2003)**. In order to minimize sleep problems among older adults, different approaches have been recommended such as stimulus control, sleep restriction, cognitive behavior therapy and sleep hygiene (**Buysse et al., 2011 and Ho et al., 2015**). The study philosophy emerged to apply sleep hygiene approach to encourage healthier sleep habits, lower sleep obstacles and crafting persistent sleep schedule.

The study results revealed that in pretest older adult had poor sleep hygiene index table 3. This may be due to more than half of them were living in shared room, spend most of their time watching television at night and did not believe it affected their sleep, they had the option to nap during the day, presence of environmental stimuli such as noises and continuous lighting which cause mind distraction. This result is congruent with **Chehri&Parsa (2019)** who conducted study on older adult live in Kermanshah, Iran, and declared that exceeding half of the studied older adults had bad sleep hygiene, also goes in line with **Annisa&Wati(2020)** study that conducted in four elderly care institutions in Jakarta, Indonesia and reported that over half of the residents had poor sleep hygiene.

The study results also showed statistically significant improvements in elderly's total sleep hygiene index post-intervention. This may be due to application of sleep hygiene approach that enables participants to be more informed on how their environment affected their sleep, they were able to achieve better sleep and elderly practiced a greater control of their environment as sleeping environment which consider key factor in determining the level of sleep satisfaction that one will attain **Yang, Lin, Hsu & Cheng (2010)**.

This result is goes on line with **Abdelmoneem and Fouad (2017)** who conducted sleep hygiene program on older adults in Egypt and their results reveals that there were statistically significant improvements after program application in sleep hygiene behavior and practice. Also, congruent with **Oh et al, (2018)** who conducted study to evaluate the effects of the brief intervention for insomnia (BII) on older adults dwelling and their results pointed out that there was significant improvement in sleep hygiene index, sleep related features and sleep diary. At the same line **Avidan (2015)**, results that accentuate noticeable improvement in sleep hygiene practice among geriatric after providing sleep hygiene training for eight weeks.

According to the present study, elderly PSQI is statistical improved post program implementation as shown in table (4). This may be due to elder realized importance of healthy sleep on physical, mental and emotional status so, they trying greater efforts to obtain high quality and sufficient quantity of sleep. Acknowledging the benefits of sleep hygiene intervention enables participants to be more enthusiastic, committed and paying attention to their sleeping environment **Helms (2006)**.

This findings was consistent with **Sharma&Srivastava (2018)** results who conducted sleep hygiene program on elderly subjects living in New Delhi, India and found that sleep hygiene program is an effective tool in improving sleep quality, also congruent with **Solikhah, Nursalam, & Ulfiana (2017)** who studied elderly in public nursing home in Surabaya in Indonesia and found that sleep hygiene has a significant improved sleep quality in elderly. Also goes on line with **Alessi et al. (2016)** who designed program about sleep education for community-dwelling veterans aged 60 and older, their results showed that sleep education delivered improves sleep quality in older adults with chronic insomnia.

On the other extreme, the study results were in consistent with **McCurry, et al (2007)** who studied different psychological interventions for sleeplessness adduced that none of these psychological interventions alone can treat insomnia, also **Black, O'Reilly, Olmstead, Breen & Irwin (2015)** who studied effect of two

interventions standardized mindful awareness practices (MAPs) and sleep hygiene education (SHE) on sleep quality and their results indicated that SHE showed has no significant improvement on sleep quality.

Result shows no remarkable improvements in depression anxiety and stress levels (DASS-21) among elderly post-intervention as shown in study results. This may be due to long term resident in geriatric homes, 88.7% of them had chronic disease, feeling loneliness, high burden of comorbidities and 33.8% had in sufficient income. Living in elderly institutions for long time, reduce physical activeness, weak social relationships, lesser exposure to sunlight and influence sleep **Li, Chang&Porock, (2015)**.

This result goes in line with **Dopp, 2017** who studied relative effects of sleep hygiene behavior among 104 participants allocated to intervention and his results stated that intervention has no effect on cognitive and emotional well-being and there isn't a significant effect of improvement on sleep quality from social and emotional behaviors. On the other hand the results inconsistent with **Weiss et al., (2006)** whose result showed that sleep hygiene protocol can lead to immense psychological, physiological benefits, a general well-being characterized by positive mood, vitality, and a general increase in interest in life. Similar result **Chun, Kim&Noh (2017)** who conducted their study for Korean elderly women living at home and found that sleep program was effective in improving sleep disturbance, depression and anxiety.

The study results portrayed statistically significant positive correlation between SHI scores, PSQI scores, anxiety, depression and stress as shown in table (6). This congruent with **Cho, Kim & Lee (2013)** who affirmed positive association between sleep hygiene index and sleep quality. By the same token, several studies confirmed that better sleep hygiene behaviors are linked with good sleep quality **Petit et al., (2003)**. This finding is also, consistent with **Chehri, Kiamanesh, Ahadi&Khazaie (2016)** results that portrayed positive relationship between hygienic practice of sleep and PSQI total score. **Tanaka & Tamura (2016)** also in their study in Japan reported that good sleep quality reflected positively on elder mental health and their aspect of life. Results also in line with study conducted among the elderly in urban communities in China by **Liu, etal, (2017)** that declared positive association between depression, stress and sleep quality within the impact of perceived stress on depression.

Also agree with study conducted in Shenzhen, a migrant city in China on 1756 internal migrant workers revealed that the poorer quality of sleep for older participants, the more increase in anxiety levels **Yang, etal (2020)**. Also, **El-Tantawy , Al-Yahya, Raya& Mohamed (2014)** stated that Patients with anxiety or depressive disorders who have sleep disorders have higher PSQI scores ($P < 0.01$). Adequate sleep is associated with improvement in mental health, clarity of mind, and increased energy. In addition, adequate sleep lowers the anxiety level and improves memory, concentration, and focus **Baglioni, Spiegelhalder, Lombardo, & Riemann (2010)**.

Results accentuate significant negative correlation between education level, SHI scores, depression and stress. This is consistent with **Thichumpaetal.,(2018)** who emphasized through his study in northern Thailand that being female and a higher education were significantly associated with elder sleep ,in addition to **Byles, Mishra& Harris (2015)** study that conducted in Iran on elderly and showed that education completion affects sleep quality patterns. Similar results a study conducted by **Dollander, (2002)** who stated education play a crucial role in lowering elder sleep problems.

Regression analysis revealed that intervention, age, working, private room, female gender and smoking were significant predictors and had effect on SHI scores, meanwhile other variables had no effect on SHI scores table (8) this is supported by **Linden (2011)** regression analysis which revealed that genetics and smoking items predicted poor sleep hygiene. In the same line **Bani,etal (2014)** who studied elderly in Tabriz Iran, displayed significant relation between genders, income, number of household and sleep hygiene fulfillment. Results are in consistent with **Abdelmoneem&Fouad (2017)** who declared that elderly demographic characteristics have no effect on sleep hygiene except in one item which was chronic disease.

As regard multiple linear regression models for PSQI scores the results revealed that intervention, private room and insufficient income was significant predictor of PSQI scores, meanwhile other variables had no effect table (9). This results is consistent with **Gamaldo, etal (2014)** who studied American older adults from the Baltimore and regression analyses of their results revealed that current financial strain (income), interpersonal problems, and stress were significant predictors of poor sleep quality. Also, consistent with **Sharma&Srivastava (2018)** results that intervention is an important predictor for improving the sleep quality and stress level of elderly. Unlike the findings **Wang,etal (2020)** declared that female sex and clinical comorbidities such as hypertension, coronary heart disease are only significant predictor of sleep quality ,also in consistent with **Dağlar,Pinar,Sabancıogullari&Kav(2014)** study that conducted in Sivas, a central Anatolian city in Turkey and find that personal variables such as income has no effect on sleep quality ($p > 0.05$) and the study conducted on 123 attendees aged 60 years at Kebangsaan Malaysia and found that socio demographic characteristics as sex, race and living adjustment weren't correlated to sleep quality **Razali, etal (2016)**.

V. Conclusion

Implementation of sleep hygiene program improved resident older adults sleep hygiene index and Pittsburgh sleep quality index (PSQI), meanwhile depression, anxiety and stress scale (DASS-21) wasn't improved. There was statistically significant positive correlation between sleep hygiene index, sleep quality, depression, anxiety and stress scale.

VI. Recommendations

Application of sleep hygiene programs on a long term base for elderly in geriatric home. It is recommended to replicate sleep hygiene approach in conjunction with other non-pharmacological approaches for better beneficial effects on sleep. Sleep hygiene education should be involved in elder routine of care in geriatric home. Further research is needed to determine best sleep non-pharmacological approaches with beneficial effects on depression, anxiety and stress scale.

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