Sleep Disturbance and Associated Factors among Adult People Living with HIV/AIDS at Dessie Referral Hospital Antiretroviral therapy clinic, Northeast, Ethiopia

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Abstract

Background

Sleep disturbance is the leading health problem in the era of HIV/AIDS. The exact cause of sleep disturbance was not well known, but it is related to HIV itself, antiretroviral drugs side effect, and other HIV related disorders. This study aimed to assess the prevalence of sleep disturbance and associated factors among adult people living with HIV/AIDS.

Methods

A cross-sectional study was conducted. A total of 419 study participants participated in the study. A systematic random sampling method was employed. An interviewer-administered a method of data collection with a chart review was used. Pittsburg Sleep Quality of Index for assessing sleep disturbance was used. A binary logistic regression was conducted. The variables having a p-value < 0.05 with 95% CI were used to declare an association.

Results

The prevalence of sleep disturbance was 36% (95% CI: 31–41%). The study revealed that being female (AOR = 3.45, 95% CI: 1.52–7.79), viral loads ≥ 1000 copies /ml (AOR = 6.88, 95% CI: 2.79–16.9), CD4 cell count < 200 cells/mm³ (AOR = 6.85, 95% CI: 2.42–19.39), WHO stage II and III (AOR = 4.29, 95% CI: 1.05–17.53), having anxiety (AOR = 10, 95% CI: 4.21–23.9), having depression (AOR = 4.4, 95% CI: 1.95–10.1), having not a separated bedroom (AOR = 3.94, 95% CI: 1.86–8.36), and living alone (AOR = 6, 95% CI: 2.81–13.12) were found to be factors associated with sleep disturbance.

Conclusion

In this study, more than one - thirds of the study participants were developed sleep disturbance. Being female, low CD4 cell counts, viral load ≥ 1000 copies/ml, WHO stage II and III, having depression and anxiety, living alone, and have not a separate bedroom have increased the experience of sleep disturbance.

Background

Sleep disturbance is the leading health problem among people living with HIV/AIDS (PLWHA). It a symptom characterized by difficulty in initiating and maintaining sleep, excessive somnolence, disturbed sleep-wake schedule, and dysfunctions associated with sleep and sleep stage (1). The causes of sleep disturbance among PLWHA were still not well known, but some of the previous studies have suggested that HIV itself affects the central nervous system, lower immunity, antiretroviral medication side effects,

and mental health issues largely affect the sleep quality (2–4). Low CD4 cell count, Efaviriz-based antiretroviral therapy (ART) regimen, duration of living with HIV/AIDS, stress, anxiety, and depression were risk of sleep disturbance (5–9).

Sleep disturbance leads to non-adherence to their recommend medications (10) which leads to a disease progression to a fatal stage (11). Decreased job performance, absent from work, more prone to accidents, decreased quality of life, increased health care cost, high rate of psychiatric co-morbidities (12), altered cognitive functioning (13), increase the risk developing hypertension, overweight (14), and increase unprotected sexual intercourse (15) were the major complications of sleep disturbance among PLWHA.

Simultaneous occurrence of sleep disturbance with HIV infection makes clinical management more complicated, so understanding the magnitude and major factors of sleep disturbance is playing a key role to identify and treat mental health problems early as much as possible. In Ethiopia, there is limited information on the prevalence and associated factors of sleep disturbance among adult PLWHA. Therefore, this study provides evidence on the prevalence and contributing factors for sleep disturbance. Besides, the results of the study provide baseline information for palliative care strategies to optimize and improve the quality of life by improving the service quality.

Methods

Study Setting

The study was conducted at the Dessie Referral Hospital adult ART clinic. The Dessie town is found in the Amhara regional province which is 451 Km from Addis Abeba. The hospital started ART service since 1998 E.C. At the moment, there were around 5920 HIV positive patients enrolled in the ART clinic of which 5664 were adults. All adult PLWHA who were attending at ART clinic were considered as source population whereas those adult PLWHA attending the ART clinic during the data collection period were taken as the study population.

Sample Size Determination

The sample size was determined using a single population proportion formula considering the assumptions of a 95% confidence interval, 45.8% population proportion from the previous study (14), and 5% marginal error. Taking a 10% non-response rate, the final sample size was 419. The sampling frame was developed based on the order of coming to the clinic. The sampling unit was determined and using systematic random sampling the study participants were selected every person pattern.

Operational Definitions

Sleep disturbance

Participants having a global score of Pittsburgh Sleep Quality of Index (PSQI) > 5 were considered as having sleep disturbance whereas having a global score of PSQI ≤ 5 taken as having no sleeping disturbance (16).

Stress

On the perceived stress scale(PSS) a participant having a mean score of 0–13 will be classified as low stress,14–26 moderate stress, and 27–40 sever stress (17).

Depression

Participants who had a mean score > 8 considered as having depression were as a score of $8 \leq$ was considered as no depression. Participants who had a mean score > 8 considering as having anxiety ≤ 8 no anxiety from anxiety (18).

Data Collection Tools And Procedures

A structured interviewer-administered questionnaire with a chart review was employed to collect data. The questionnaire includes socio-demographic factors, clinically factors, personal and behavioral factors, and psychosocial factors. A validated PSQI tool was used. Its Crobach alpha is (0.88) (19, 20). Sleep disturbance assessed with the 19 item questionnaires with 7-components including, subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction during the last one month. Perceive stress scale (PSS) was used to assess the client's stress condition. It had 10 item stress scales ranging from 0–4 points Likert scale with a score of minimum 0 and maximum 40 (17).

Anxiety was measured using the hospital anxiety scale. The tool had a 7 Likert scales ranging from 0–3 with minimum 0 and maximum of 21 scores, which the higher score indicated had anxiety (18).

Depression was measured using the hospital depression scale. It had a 7 Likert scale ranging from 0–3 points with score minimum 0 and maximum scores of 21, the minimum score indicates no depression and the higher score indicates having depression (18). Four BSc nurses (three data collectors and one supervisor were used.

Data Processing And Analysis

Data were coded and entered into Epi Info Version 7 then exported to SPSS version 20 for analysis. Both descriptive and analytical statistical procedures were utilized. Descriptive statistics such as percentage, mean, median, standard deviation, and inter-quartile range (IQR) were used. Tables and bar graphs were also used for data presentation. A binary logistic regression model was used to identify factors associated with sleep disturbance. All explanatory variables enter into the multivariable logistic

regression model to control the possible effect of confounders. The effect of variables on sleep disturbance was declared based on a 95% CI and p-value < 0.05. Model fitness was checked using Hosmer and Lemeshow goodness of a fit test.

Results

Socio-demographic characteristics of the study participants

A total of 419 participants were enrolled in the study, making a 100% response rate. The median (IQR) age of participants was 36 (IQR 18–77) years. Nearly two-thirds (63.7%) were females. Among study participants 180 (43%) were married, 242 (57.8%) were Muslim, 149 (35.6%) were attended primary school, 357 (85.2%) were urban dwellers, and 108 (25.8%) were currently daily laborer. The median average family monthly income was 800 Ethiopian birr (IQR, 200–9000) (Table 1).

Table 1
Socio-demographic characteristics of PLWHA at Dessie Referral Hospital ART clinic, Northeast Ethiopia, 2019 (n = 419).

Variables	Frequency(n)	Percent (%)
Sex		
Male	152	36.3
Female	267	63.7
Age group		
18–35 years	207	49.4
> 35 years	212	50.6
Marital status		
Single	109	26
Married	180	43
Divorce	79	18.9
Widowed	51	12.2
Religion		
Orthodox	172	41.1
Muslim	242	57.8
Protestant	5	1.20
Education		
Unable to read and write	114	27.2
Primary school	149	35.6
Secondary school	95	22.7
College and above	61	14.6
Residence		
Urban	357	85.2
Rural	62	14.5
Occupation		
Student	64	15.3
Daily labour	108	25.8

Variables	Frequency(n)	Percent (%)
Farmer	35	8.4
House wife	85	20.3
Civil servant	55	13.1
Merchant	16	3.8
Monthly income		
≤ 1000 birr	266	63.5
> 1000 birr	153	36.5

Clinical Characteristic Of The Study Participants

Among study participants, 266 (63.5%) had > 5 years since first HIV diagnosis, 114 (27.2%) were overweight, 393 (93.8%) were WHO treatment stage I, 258 (61.6%) had CD4 count > 350 cells/mm³, and 255 (60.85%) had viral loads < 1000 copies /ml. Regarding ART status, 281 (67.1%) were used efavirenz-based regimen and 266 (63.5%) had good ART adherence. Nearly fifteen percent of study participants had co-morbidity and six percent of the participants' had history opportunistic infections (Table 2).

Table 2
The clinical characteristics of PLWHA at Dessie Referral Hospital
ART clinic, Northeast Ethiopia, 2019 (n = 419).

Variables	Number (n)	Percent (%)
Duration HIV infection		
> 5 years	266	63.5
≤ 5 years	153	36.5
BMI		
18.5–25 kg/m ²	255	60.9
<18 kg/m ²	50	11.9
> 25 kg/m ²	114	27.2
Current WHO staging		
Stage I	393	93.8
Stage II and above	26	6.2
Recent CD4 cell count		
> 350 cell/mm ³	255	60.85
200-350cell/mm ³	83	19.8
< 200cell/mm ³	81	19.33
Recent viral load		
< 1000copy/ml	315	75.4
≥ 1000 copy/ml	104	24.6
Current ART regimen		
Efavirez based ART regimen	281	67.1
Nevirapine -based ART regimen	100	23.9
Lobenavir /Atazanavir based ART	38	9.1
ART adherence		
Good	279	66.6
Fair	70	16.7
Poor	70	16.7

Variables	Number (n)	Percent (%)
History of co-morbidity		
Yes	61	14.6
No	358	85.4
Current opportunistic infection		
Yes	26	6.2
No	393	93.8

Psychosocial and behavioral characteristics of the study participants

Among study participants, 128 (30.5%) had anxiety, 156 (37.2%) had depression, and 49 (11.7%) had severe stress. Regarding behavioral habits, 55 (13.1%) were chewed khat once in their lifetime, 46 (11%) were currently chewing khat, 30 (7.2%) were currently drinking alcohol, and 16 (3.8%) were currently smoking a cigarette (Table 3).

Table 3
Psychosocial and behavioral characteristics of PLWHA
at Dessie Referral Hospital, ART clinic Northeast
Ethiopia, 2019 (n = 419).

Variables	Frequency(n)	Percent (%)
Anxiety		
Yes	128	30.5
No	291	69.5
Depression		
Yes	156	37.2
No	263	62.8
Stress		
Low	73	8.8
Moderate	333	79.5
Sever	49	11.7
Khat chewed status		
Never chewed	318	75.9
Former chewed	55	13.1
Current chewed	46	11
Alcohol drink status		
Yes	30	7.2
No	389	92.8
Smoking status		
Never Smoked	381	90.9
Former smoked	22	5.3
Current smoked	16	3.8

Prevalence Of Sleep Disturbances

The prevalence of sleep disturbance among PLWHA was found to be 36%(95%CI; 31%-41%) of which 118 (78.1%) females. The median PSQI score was 3 (IQR: 0–17).

Characteristics Of Sleep Pattern Of The Study Participants

The participants went to bed on average 10:02 pm and wake up in the morning at 4: 08 am. The mean time slept each night was 7:02 hrs (SD $\pm$ 1.07hours). Two hundred twenty one (52.7%) had very good sleep quality, 120 (28.6%) had slept with > 60 minutes and 86 (20.5%) slept < 5:00 per 24:00 hours (Table 4).

Table 4
Characteristics of Sleep among PLWHA at Dessie Referral Hospital, ART
clinic 2019 (n = 419).

Variables	Frequency (n)	Percent (%)
sleep Quality		
Very good	221	52.7
Fairly good	80	19.1
Fairly bad	40	9.5
Very bad	78	18.6
Sleep latency		
< 15mints not during the past month	170	40.6
16–30 mints once or twice a week	78	18.6
31–60 min once or twice a week	51	12.2
> 60 mints 3times a week	120	28.6
Sleep duration		
> 7hrs	251	59.9
6–7 hrs	47	11.2
5–6 hrs	35	8.4
< 5 hrs	86	20.5
Habitual sleep Efficacy		
≥ 85%	319	76.1
75%-84%	17	4.1
65%-74%	30	7.2
< 65%	53	12.6
Sleep disturbance		
none	193	46.1
mild (1–9)	207	49.4
moderate (10–18)	3	0.7
Sever (19–27)	16	3.8

Variables	Frequency (n)	Percent (%)
Used sleep medication		
Not during the last month	390	93.1
less than once a week	12	2.9
once or twice a week	6	1.4
≥ 3 times a week	11	2.6
Daytime dysfunction		
No problem	280	66.8
Slight problem(1–2/week	109	26
Moderate problem > 2/week)	21	5
Big problem > 3/week	9	2.1

Reasons For Difficulty In Maintaining Sleep

The above half (56.6%) of PLWHA were facing the difficulty in maintaining sleep due to unable to fall within 30 minutes (Fig. 1).

Factors Associated With Sleep Disturbance

All variables were computed in bivariable and multivariable logistic regression analysis to test the presence of an association. In multivariable analysis; being female (AOR = 3.45, 95% CI; 1.52 – 7.79), viral loads ≥ 1000 copies (AOR = 6.88, 95% CI; 2.79–16.9), CD4 cell < 200 cells/mm³ (AOR = 6.85, 95% CI; 2.42–19.39), WHO stage II and III (AOR = 4.29, 95% CI; 1.05–17.53), having anxiety (AOR = 10, 95% CI; 4.21–23.9), having depression (AOR = 4.44, 95% CI; 1.95–10.10), having separate bedroom (AOR = 3.94, 95% CI; 1.86–8.36), and living alone (AOR = 6, 95% CI; 2.81–13.12) were determinant factors of sleep disturbance in PLWHA (Table 5).

Table 5
Factors found significant multivariate analysis among PLWHA at Dessie Referral Hospital
ART clinic, 2019 (n = 419).

Variable	Sleep disturbance		COR (95%CI)	AOR (95%,CI)
	Yes	No		
Sex				
Female	121	146	3.37(2.114,5.373)	3.45 (1.52–7.79)*
Male	30	122	1	1
Taking coffee and tea				
No	69	137	1	
Yes	82	131	1.24(0.83–1.85)	
Smoking status				
Never smoked	126	255	1	
Current smoker	11	5	4.4(1.5–13)	
Past smoker	14	8	3.5 (1.4–8.7)	
Khat chewing				
Never chewed	95	223	1	
Past chewed	27	28	2.26 (1.27-4)	
Drinking alcohol				
no	136	253	1	
Yes	15	15	1.86(.88-3.92)	
Viral loads				
< 1000 copies/ml	77	236	1	1
≥ 1000 copies/ml	74	28	8.1 (4.88–13.42)	6.88 (2.79–16.9)**

Table 5

Continued; Factors found significant multivariate analysis among PLWHA at Dessie Referral Hospital ART clinic, 2019 (n = 419).

Variables	Sleep disturbance		COR (95%CI)	AOR (95%,CI)
	Yes	No		
CD4 cells				
> 350 cells/m3	66	192	1	1
200–350 cells/mm3	29	51	1.7(1-2.8)	
< 200 cells/mm3	56	25	6.5 (3.8–11)	6.85(2.422–19.39)**
WHO stage				
Stage I	138	255	1	1
Stage II& above	13	13	1.84(.833 – 4.09)	4.29(1.05–17.53)*
Depression				
No	32	231	1	1
Yes	119	37	23 (13.8–39)	4.44 (1.95–10.1)**
Anxiety				
No	42	249	1	1
Yes	109	19	34(18.9–61)	10(4.212–23.93)**
Separate bedroom				
Yes	35	185	1	1
No	116	83	7.4 (4.7–11.7)	3.94 (1.86–8.36)**
Live alone				
No	38	224	1	1
Yes	113	44	15.14 (9 -24.7)	6(2.81–13.12)**
*=p value = < 0.05 **= p value = < 0.001				

Discussion

The current study showed that the prevalence of sleep disturbance among adult PLWHA was found to be 36% (95% CI: 31–41%). The prevalence was higher among females 118 (78.1%). The finding of this study is in line with a study conducted in) and the USA, 40.93% (7) and China, 32.1%(9). It was lower than the

study conducted in Nigeria 45.8% (14), Cameroun 66.7% (21), China 43.1% (8), Iran 47.5% (22), German 63% (23), Paris 68% (16) and 63% (24). The discrepancy was in socio-cultural characteristics, sampling methods, study setting, design, type of tool, and data collection methods. On the contrary, the finding of this study was higher than the study conducted in South Africa 16% (25). The possible reason for this discrepancy may be due to the former study used longitudinal follow up which may lead to loss to follow.

The current study revealed that sex was the determinant factor of sleep disturbance. Being female was 3.45 times more likely to develop sleep disturbance compared to their counterparts (AOR = 3.45, 95% CI; 1.52 – 7.79). In females, during the premenopausal/menopausal period, there was a hormonal imbalance of estrogen and progesterone that decreased the level of estrogen as well progesterone level which results in a two-fold increase in the number of arousals after sleep occurs this decreased total sleep time (26).

Participants having viral loads greater or equal to 1000copies /ml were nearly 7 times more likely to develop sleep disturbance compared to those clients having viral loads less than 1000 copies/ml (AOR = 6.88, 95% CI; 2.79–16.9). This is supported by a study conducted in California (10). High viral loads in the peripheral circulation enhance the HIV to enter into the central nervous system which activates macrophages and astrocytes (27) and consequently impaired their function which decreased the release of sleep regulatory substances(TNF-alpha) (28). Viral load increments associated with the disease progression to the chronic stage which changes sleep as more arousal and waking during sleep periods (29).

The odds of experiencing sleep disturbance among adult PLWHA who were WHO stage II&III was 4.29 times compared to those WHO stage I (AOR = 4.29, 95% CI; 1.05–17.53). This is supported by a study conducted in UAS (30). Having advanced WHO clinical stage may lead to developing opportunistic infections that impair sleep quality.

Participants having a CD4 cells counts less than 200 cells/mm³ were nearly 7 times more likely to develop sleep disturbance compared to those having CD4 cells count greater than 350 cells/mm³ (AOR = 6.85, 95% CI; 2.42–19.39). This is supported by a study conducted in Nigeria (5) and the USA (31). Immune decrements associated with HIV infection is directly linked to the psyche by a complex network of nerves, hormones, and neuropeptides. This network has a direct impact on sleep (14). It has been well documented that CD4 + cell count decreases, whereas viral load increases with the progression of HIV, consequently the quality of sleep worsens along the course of the disease, this related to CD4 + cell count and viral load as well (32).

Participants who had depression were 4.44 times more likely to develop sleep disturbance compared to those have no depression (AOR = 4.44, 95%CI; 1.95–10.10). This is supported by a study conducted in German (23) and five cities in the USA (7). Depression had a directional association between sleep disturbances (8). The reason is that in depression, the sleep-dependent component of sleep regulation is

deficient and does not rise to its usual level. Due to this, the sleep amount of slow-wave sleep is reduced and the sleep period also shortened (33).

In the current study, participants who had anxiety were 10 times more likely to develop sleep disturbance compared to those participants with no anxiety (AOR = 10, 95% CI; 4.21–23.9). This is supported by a study conducted in China (8) and the USA (34). The reason is that, according to the polysomnographic features that characterize patients with anxiety have longer sleep onset latency, a greater number of arousals, and greater wake time during the night, fewer transitions into non-REM sleep (35).

In the present study, participants who lived alone had 6 times more likely to developed sleep disturbance compared to those living with their family (AOR = 6, 95% CI; 2.81–13.12). This is supported by a study conducted in the USA (36). Physical and social aspects of sleeping arrangements have been negatively affected the sleep quality (32). Better family and social support were associated with better sleep quality. Living with a supportive family can have a positive effect on mood, preventing social isolation, and promoting healthy sleep habits. Moreover, social support may help maintain a more consistent and consolidated sleep-wake schedule and may affect sleep by attenuating the effects of psychological stress on sleep (6, 37).

In the is study, participants who did not live in the separate bedrooms were nearly 4 times more like to develop sleep disturbance compared to those who lived in the separate bedrooms (AOR = 3.94, 95%CI; 1.86–8.36). This is supported by a study conducted in the USA (36). Sleep can be disrupted by a variety of factors related to the location of the bedroom in the house. Lack of separate bedrooms for sleep was predisposed to extra sound and light, sense of lack of security, expose for bright room colures, image or art, lack of privacy were negatively influence on the sleep quality (38).

Limitation

Variables such as sleep with partner and family size may affect sleep quality but this issue did not incorporate in the current study. Substances (Alcohol, cigarette, and khat) uses were not measured quantitatively.

Conclusion

The finding of this study showed that more than one-third of the study participants had sleep disturbance at the Dessie Referral Hospital ART clinic. Being female, low CD4 cell counts, viral loads ≥ 1000 copies/ml, WHO stage (II and III), depression, anxiety, living alone, and having no separate bedrooms are factors associated with sleep disturbance.

List Of Abbreviations

ART; Antiretroviral Therapy, BMI; Body Mass Index, E.C; Ethiopian Calendar, HADS; Hospital Anxiety-Depression Scale, PLWHA; People Living with HIV/AIDS, PSQI; Pittsburg Sleep Quality Index, WHO; World

Declarations

Ethical approval and consent to participate

The study was approved by the Research Ethical Review Committee of the School of Nursing, College Medicine and Health Sciences on the behalf of the University of Gondar Research Ethical Review Board with the ref no. S/N/ 1600/06/2011 and approved on the date of 25/06/2011E.C. A formal letter indicating the approval obtained and submitted to Dessie Referral Hospital administrative. Written informed consent was obtained from each participant and personal identification like the name, phone number, and medical registration numbers were not used to maintain confidentiality.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available at the corresponding author for reasonable request.

Competing interests

The authors declare that there is no competing of interests

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The author did not receive any fund

Authors' contribution

FSD wrote the proposal, participated in data collection, analyzed the data, and drafted the manuscript. YB and AWA approved the proposal with revisions, participated in data collection, data analysis and revised subsequent drafts of the manuscript. All the authors read and approved the final manuscript.

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Figures

Figure 1

The reasons for the difficulty of sleep among PLWHA at Dessie Referral Hospital, ART clinic Northeast 2019.