ORIGINAL ARTICLE

Prevalence Of Insomnia Among Schizophrenia Patients and Its Relation to Suicide and Symptom Severity

Eman Ali , Nelly R Abdel Fattah , Mohamed Gamal Negm , Sahar Mostafa Ahmed*

Psychiatry Department, Faculty of Medicine, Zagazig university

*Corresponding author:

Sahar Mostafa Ahmed

Email:

doctor.sahar.mostafa@gmail.com

ABSTRACT

Background: Schizophrenia (SZ) is one of the most prevalent psychological conditions, and a psychiatric history and mental health check diagnose it. There are no laboratory tests for schizophrenia. Signs and symptoms vary and involve alterations in emotion, perception, thinking, cognition, and behavior.This study aims to detect the prevalence of insomnia and the relation of insomnia to suicide for early recognition and reducing suicidal ideas in SZ cases that will be reflected for the benefit of the patient in a more structured and suitable management plan.

Methods: This cross-sectional study was performed at the Psychiatry Department, Faculty of Medicine, Zagazig University Hospitals. 210 cases were assessed according to the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) SZ's criteria. All cases conducted clinical and psychometric assessments including Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Positive and Negative Symptoms Scale (PANSS) measuring the severity of symptoms, Beck Scale for Suicidal Ideation (BSS), Calgary Depression Scale for Schizophrenics (CDSS), and Insomnia Severity Index (ISI).

Results: There was a significant association between depression and all of the sex, occupation, number of off-springs and coffee/tea drinks, off-spring, disease duration, hospitalization, insomnia severity, suicide, and suicide attempts (P<0.01). There was a statistically significant relation between suicidal ideation and all number of hospitalizations, positive, negative, general and total PANSS, insomnia severity, and depression (p<0.01).

Conclusion: These findings highlight the imperative of incorporating sleep-focused interventions into the comprehensive management of SZ to alleviate symptom burden and enhance overall well-being.

Keywords: Insomnia; Schizophrenia; Suicide; Symptom Severity.

INTRODUCTION

Schizophrenia (SZ) is a widespread and severe chronic mental condition that affects around one percent of the population worldwide [1]. Insomnia is a common, yet often overlooked, symptom of SZ. Following an epidemiological study, insomnia develops commonly in the clinical phase of chronic schizophrenia, with an approximate incidence of 23 to 44% [2].

Furthermore, researchers assumed that insomnia not only increases the incidence of SZ but it also worsens existing symptoms and complicates management [3].

Growing data suggests that sleep disruption can be an indicator of risk for or a preliminary symptom of psychosis; it may additionally exacerbate psychotic symptoms, thereby interacting with SZ therapy [4]. There is growing confirmation that sex variations in SZ have been observed in categories such as incidence, clinical symptoms, and therapeutic efficacy [5]; in addition, studies reported that

females with SZ had lower sleeping habits than males [6].

There is a strong link between sleeplessness and suicidal thoughts and behavior across a variety of psychiatric conditions. Meta-analytic data suggests a two-fold higher probability of suicidal behavior in psychiatric cases with versus without concomitant sleep disorder, mainly insomnia [7].

There is a developing concern in these relationships in people with SZ, where suicidal thoughts and conduct and suicide death are widespread [8].

As a result, research has looked into the links between sleeplessness and suicidal ideation and behavior in SZ cases. In an investigation of individuals with non-affective psychosis and persecutory delusions, sleeplessness was substantially and directly linked with the intensity of suicidal thoughts [9].

Some research supports connections between insomnia and the severity of psychopathy in SZ and assumes sleeplessness to be a marker of greater psychopathology scores, determined by the Positive and Negative Syndrome Scale (PANSS) [9]. A small longitudinal pathway evaluation discovered that sleeplessness was connected with paranoia and hallucinations in SZ cases [4].

Considered together, our results will add to the expanding body of data linking sleeplessness, suicidal thoughts, and symptom severity in schizophrenia. They also have substantial clinical consequences concerning the necessity for recognizing, assessing, and treating insomnia in this case population.

Our work aims to detect the relationship between insomnia to suicide for early recognition and reducing suicidal ideas in SZ patients that will be reflected for the benefit of the patient in a more structured and suitable management plan.

METHODS

This cross-sectional study was performed at the Psychiatry department, Faculty of Medicine, Zagazig University Hospitals, during the period from 15 March 2023 to 15 September 2023. 210 patients were diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) [10] criteria for SZ and were selected by random sampling technique. The interviews and sample collection were done over 6 months, from 15 /03/ 2023 to 15 /09/ 2023. The interview ranged from one to two hours. Verbal and written informed consent were obtained from all participants after an explanation of the procedure and medical research. The research was conducted under the World Medical Association's Code of Ethics (Helsinki Declaration) for human research. This study was carried out after the approval of the Institutional Review Board (IRB). IRB#:10505/5-3-2023

Cases with the following criteria were included: cases who meet DSM-5 criteria for SZ, with an age range from 15 to 65 years of both sexes, and with all social classes. Cases with the following criteria were excluded: age below 15 and above 65, any medical illness or neurological disorder, and the presence of other psychiatric illness, intellectual disability, dementia or delirium. Cases with substance abuse and refusal to sign the consent.

All cases were subjected to complete history-taking clinical and psychometric assessments.

Psychometric assessment:

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) Arabic version:

SCID-I was applied to confirm the diagnosis of SZ and substance use disease. The main employment of the SCID is for diagnostic evaluation, research, and training for mental health practitioners. It evaluates 33 of the more often occurring mental illnesses specified in DSM-IV of the American Psychiatric Association, axis I condition [11]. ElMissiry et al. [12] conducted a study that translated and verified the Arabic version of the SCID-I employed in this study.

PANSS evaluates the severity of symptoms

PANSS is one of the best-validated tools for evaluating general negative and positive psychopathology correlated with SZ. The PANSS is a validated medical interview for patients with SZ that evaluates the existence and intensity of negative and positive symptoms and general psychopathology during the previous week. Seven of the 30 items are positive (score range 7-49), seven are negative (score range 7-49), and 16 are general psychopathology symptoms (score range 16-112). Each item's symptom intensity is assessed based on the anchoring points (1=absent; 7=extreme) that best reflect the symptom's manifestation [13].

Beck Scale for Suicidal Ideation (BSS):

BSS is a self-report scale that includes 19 items with total scores ranging from 0 to 48. The 19 items are "Wish to live, Wish to die, Reason for living, Active attempt, Passive attempt, Duration of thoughts, Frequency of ideation, Attitude toward ideation, Control over action, Deterrents to attempt, Reasons for the attempt, Specificity of planning, Availability/opportunity, Capability, Expectancy, Actual preparation Suicidal note, Final acts, Deception". There are no defined cut-off scores used for assessing severity or guiding case therapy. Raising scores indicate elevated suicide risk, and any positive reaction warrants examination [14]. Cut-off≥24 was used in our study [15]. The Arabic version utilized in the present research was translated and utilized in earlier studies [16].

Calgary Depression Scale for Schizophrenics (CDSS)

The depression symptoms were assessed using the CDSS. The CDSS is a nine-item questionnaire with a global score of 0 to 27 points [17]. Cut-off≥6 was used in our study [18].

Insomnia Severity Index (ISI)

The ISI consists of seven criteria that assess the severity of sleep-onset and sleep preservation difficulties, satisfaction with present sleep routine, influence on daily activities, noticeability of deterioration due to the sleep problem, and degree of distress or worry triggered by the sleep problem. Each item is graded on a scale of 0 to 4, with a total score ranging from 0 to 28. A higher score indicates serious insomnia. The overall score is construed as follows: Insomnia can be absent (0-7), sub-threshold (8-14), moderate (15-21), or severe (22-28) [19].

The Arabic version utilized in this study was translated and approved [20].

Statistical Analysis:

The software SPSS, version 26, was employed to analyze the data. Categorical variables were reported using absolute frequencies, and comparisons were made utilizing the chi-square test and, when suitable, the Fisher exact test. To compare ordinal data between the two groups, the chi-square test was performed. The Kolmogorov-Smirnov test was developed to validate assumptions for parametric tests. Quantitative variables were presented utilizing mean and standard deviation or median and interquartile range, depending on the type of data. To compare quantitative data between the two groups, the independent sample t-test was applied. To compare quantitative data between more than two groups, the one-way ANOVA test and the Kruskal-Wallis test were applied. When the difference was significant, the Bonferroni test and pairwise comparison were employed to distinguish between the two individual groups. The Spearman rank correlation coefficient was employed to determine the strength and direction of correlation between two variables. Linear regression analysis was used to determine related independent factors for the dependent factor. Binary logistic regression was employed to discover independent risk factors related to a certain health issue. $P < 0.05$ is considered significant.

RESULTS

This study included 210 patients with an age range from 20 to 59 years, with a mean of

36.6 years. Females represented 45.7% of them. The other socio-demographic data are listed in Table (1). The age of onset ranged from 15 to 47 years, with a mean age of 26.14 years. Disease duration ranged from 2 to 35 years, with a median of 8.5 years. A larger percentage (61.9%) had no history of previous hospitalization. Median positive, negative, general and total PANSS were 32, 16, 47 and 98.5. The insomnia severity index ranged from 3 to 27, with a median of 17. About 44% of patients had normal sleep, 2.4% had subthreshold insomnia, 34.8% had moderate insomnia, and 19% of them had severe insomnia. The Calgary score ranged from 4 to 16, with a median of 5. About 46% of patients had depression. 77.1% had no history of suicide attempts. 33.8% of participants presented with suicidal ideation. Beck's suicide intention score ranged from 0 to 32, with a median of 9 (Table 1).

There was a statistically significant association between the severity of insomnia and disease duration, number of hospitalizations, all positive, general and total PANSS, all negative symptoms, depression, and suicide and attempts (p<0.001) (Table 2).

Among factors significantly correlated with insomnia severity index, only positive PANSS (p<0.001), suicidal attempts number (p<0.001), number of off-springs (p<0.001), PANSS general (p=0.001), disease duration (p=0.006), and Calgary score (p=0.03) significantly independently associated with it (Table 3).

Regarding the relation between depression and other parameters, there was a significant correlation between depression and all sex, occupation, number of off-springs and coffee/tea drinks, off-spring, disease duration, hospitalization, insomnia severity, suicide, and suicide attempts (P<0.01) (Table 4).

There was a statistically significant association between suicidal ideation and all number of hospitalizations, positive, negative, general and total PANSS, insomnia severity, and depression (p<0.01) (Table 5).

Among factors significantly related to moderate and severe insomnia among studied patients, only increasing number of off-springs, number of hospitalizations and positive symptoms and general symptoms significantly independently increase the risk of moderate/severe insomnia by about 3.16, 2.79, 1.2, and 1.09 folds, respectively. Among factors significantly related to depression among studied patients, only an increasing number of hospitalizations and positive symptoms significantly independently increased the risk of depression by about 1.75 and 1.1 folds, respectively. Among factors significantly related to suicidal ideation among studied patients, only positive PANSS and severe insomnia independently increase the risk of suicidal ideation by about 1.26 and 3.88 folds, respectively. Subthreshold and moderate insomnia independently decrease risk (Table 6).

There was a significant association between insomnia and age, number of offspring, sex, residence, occupation, marital status and coffee/tea drinkers (Supplementary Table 1).

There was a significant relationship between depression and all of the sex, occupation, number of offsprings and coffee/tea drinks, off-spring, disease duration, hospitalization, suicide, and suicide attempts (P<0.01) (Supplementary Table 2).

There was a significant relation between suicide ideation and coffee/tea drinks. There was a non-significant association between suicide ideation and age, sex, occupation, number of offspring, residence, education, marital status or smoking (Supplementary Table 3).

Table (1) Distribution of studied patients according to demographic, clinical, and psychometric data:

	N=210	%/range
Age (year) [mean ± SD]	36.6 ± 10.21	20 – 59
Age of onset (year)	26.14 ± 6.8	15 – 47
Sex: Male Female	 114 96	 54.3% 45.7%
Residence: Urban Rural	 74 136	 35.2% 64.8%
Occupation Employed Unemployed/housewife	 52 158	 24.8% 75.2%
Marital status Single Married Widow Divorced	 102 82 16 10	 48.6% 39% 7.6% 4.8%
Smoking Non-smoker Smokers	 140 70	 66.7% 33.3%
Coffee/tea drinkers	96	45.7%
Duration of disease (years)	8.5(4 – 15)	2 – 35
Number of previous hospitalization No Once Twice Thrice Four times	0(0 – 1) 130 50 22 6 2	0 – 4 61.9% 23.8% 10.5% 2.9% %
PANSS Positive symptoms	32(16 – 39)	11 – 46
PANSS Negative symptoms	16(13.75 – 25)	11 – 42
PANSS General symptoms	47(29 – 61)	19 – 82
PANSS Total	98.5(66 – 120)	47 – 185
Insomnia severity index	17(6 – 21)	3 – 27
Insomnia severity Absent Sub-threshold Moderate Severe	 92 5 73 40	 43.8% 2.4% 34.8% 19%
Calgary score	5(4 – 16)	3 – 27
Depression Absent Present	 113 97	 53.8% 46.2%
Suicide attempts Absent Once Twice Three times	0(0 – 0) 162 24 22 2	0 – 3 77.1% 11.4% 10.5% 1%
Beck's suicide ideation Absent Present	9(7 – 26) 139 71	0 – 32 66.2% 33.8%

Table (2) Relation between insomnia and disease-specific, depression, and suicide data of studied patients:

	Insomnia			F	p
	Absent/subthreshold N=97	**Moderate N=73**	**Severe N=40**		
	Mean ± SD	**Mean ± SD**	**Mean ± SD**		
Age of onset (year)	25.35 ± 5.79	27.12 ± 7.37	26.28 ± 7.88	1.429	0.242
	Median (IQR)	**Median (IQR)**	**Median (IQR)**	**KW**	**p**
Disease duration (year)	8(4 – 10.5)	9(4 – 19)	13.5(4 – 20.75)	7.629	0.022*
Number of hospitalizations	0(0 – 0)	1(0 – 1)	0.5(0 – 2)	55.123	<0.001**
Positive symptoms	16(13 – 22)	37(32 – 39)	41(39 – 43)	130.091	<0.001**
Negative symptoms	15(14 – 21)	14(13 – 21)	31(25 – 38.75)	37.961	<0.001**
General symptoms	29(23 – 38)	55(45 – 60)	66(61 – 74)	130.567	<0.001**
Total symptoms	66(56 – 74)	109(96 – 117)	136(120 – 156.75)	136.924	<0.001**
Depression No Yes	 75 (77.3%) 22 (22.7%)	 31 (27.4%) 42 (43.3%)	 7 (6.2%) 33 (34%)	45.911	<0.001**
Suicide No Yes	 89 (64%) 8 (11.3%)	 47 (33.8%) 26 (36.6%)	 3 (2.2%) 37 (52.1%)	85.27	<0.001**
Suicide attempts: No One Two Three	 95 (58.6%) 2 (8.3%) 0 (0%) 0 (0%)	 57 (35.2%) 10 (41.7%) 4 (18.2%) 2 (100%)	 10 (6.2%) 12 (50%) 18 (81.8%) 0 (0%)	72.272	<0.001**
χ^2Chi square test §Chi square for trend test *p<0.05 is statistically significant **p≤0.001 is statistically highly significant					

Table (3) Linear stepwise regression analysis of factors significantly associated with insomnia severity index among studied patients

	Unstandardized Coefficients		Standardized Coefficients	t	P	95.0% Confidence Interval	
	B	**Std. Error**	**Beta**			**Lower**	**Upper**
(Constant)	-4.520	0.770		-5.870	<0.001**	-6.038	-3.001
Positive PANSS	0.349	0.047	0.503	7.497	<0.001**	0.257	0.441
Suicidal attempts	1.822	0.414	0.163	4.402	<0.001**	1.006	2.639
Offsprings	0.846	0.185	0.151	4.584	<0.001**	0.482	1.210
PANSS general	0.099	0.030	0.222	3.253	0.001**	0.039	0.159
Duration (year)	0.095	0.034	0.094	2.784	0.006*	0.028	0.162
Calgary score	0.094	0.043	0.089	2.182	0.030*	0.009	0.180
*p<0.05 is statistically significant **p≤0.001 is statistically highly significant							

Table (4) Relation between depression and disease-specific, insomnia severity and suicide data of the studied patients:

	Depression		Z	p
	No N=113 (%) Median (IQR)	Yes N=97 (%) Median (IQR)		
Offspring (if present)	2(1 – 3)	3(2 – 4)	-4.443	<0.001**
Disease duration (year)	7(4 – 12)	10(4 – 19.5)	-2.257	0.024*
Number of hospitalization	0(0 – 0)	1(0 – 1)	-5.952	<0.001**
PANSS Positive symptoms	19(15 – 34.5)	38(32 – 41)	-7.28	<0.001**
PANSS Negative PNASS symptoms	15(13.4 – 22)	20(13.5 – 31)	-2.386	0.017*
PANSS General symptoms	33(23 – 53)	59(45 – 62)	-7.546	<0.001**
PANSS Total symptoms	71(58.5 – 102)	113(98.5 – 128)	-7.53	<0.001**
Insomnia severity **Absent** **Sub-threshold** **Moderate** **Severe**	74 (80.4%) 1 (20%) 31 (42.5%) 7 (17.5%)	18 (19.6%) 4 (80%) 42 (57.5%) 33 (82.5%)	49.807	<0.001**
Suicide **No** **Yes**	96 (69.1%) 17 (23.9%)	43 (30.9%) 54 (76.1%)	38.495	<0.001**
Suicide attempts **No** **One** **Two** **Three**	105 (64.8%) 4 (16.7%) 4 (18.2%) 0 (0%)	57 (35.2%) 20 (83.3%) 18 (81.8%) 2 (100%)	29.818	<0.001**
¥Independent sample t test χ²Chi square test §Chi square for trend test *p<0.05 is statistically significant **≤p0.001 is statistically highly significant Z Mann Whitney test				

Table (5) Relation between suicidal ideation and disease-specific, insomnia, and suicide data of the studied patients:

	Suicidal ideation		χ²	p
	No N=139 (%)	Yes N=71 (%)		
Age of onset (year)	26.54 ± 5.87	25.37 ± 8.32	1.061	0.291
	Median (IQR)	Median (IQR)	Z	p
Disease duration (year)	9(5 – 15)	8(4 – 16)	-0.765	0.444
Number of hospitalizations	0(0 – 1)	1(0 – 1)	-2.964	0.003*
Positive symptoms	21(15 – 33)	39(38 – 42)	-9.439	<0.001**
Negative symptoms	15(13 – 21)	21(14 – 32)	-2.766	0.006*
General symptoms	33(24 – 50)	61(59 – 66)	-9.663	<0.001**
Total symptoms	72(59 – 102)	121(113 – 137)	-9.632	<0.001**
Depression **No** **Yes**	96 (85%) 43 (44.3%)	17 (15%) 54 (55.7%)	38.495	<0.001**
Insomnia severity **Absent** **Sub-threshold** **Moderate** **Severe**	86 (93.5%) 3 (60%) 47 (64.4%) 3 (7.5%)	6 (6.5%) 2 (40%) 26 (35.6%) 37 (92.5%)	77.923	<0.001**
t Independent sample t test *p<0.05 is statistically significant **p≤0.001 is statistically highly significant Z Mann Whitney test				

Table (6) Multivariate regression analysis of factors associated with moderate/severe insomnia, depression, and suicide among studied patients:

	β	p	AOR	95% C.I.	
				Lower	Upper
Moderate/severe insomnia					
Offsprings	1.151	0.002*	3.161	1.551	6.442
Number of hospitalization	1.025	0.04*	2.788	1.026	7.574
Positive symptoms	0.183	0.001**	1.201	1.08	1.171
General symptoms	0.085	0.024*	1.088	1.011	1.171
Depression					
Number of hospitalization	0.558	0.011*	1.747	1.136	2.687
Positive symptoms	0.098	<0.000**	1.103	1.066	1.141
Suicide					
Positive PANSS	0.234	<0.001**	1.264	1.154	1.384
No insomnia		0.002*			
Sub-threshold insomnia	-1.386	0.001**	0.25	0.024	2.576
Moderate insomnia	-1.147	0.024*	0.317	0.072	1.404
Severe insomnia	1.355	0.158	3.876	0.59	25.461
*p<0.05 is statistically significant **p≤0.001 is statistically highly significant AOR adjusted odds ratio CI Confidence interval.					

DISCUSSION

The prevalence of insomnia among cases with SZ and its potential link to suicide risk and symptom severity have become increasingly recognized areas of interest within psychiatric research. SZ, a severe and chronic mental condition affecting nearly 1% of the global population, is often accompanied by a myriad of symptoms, including delusions, hallucinations, and disorganized thinking. However, one symptom that frequently goes unnoticed or understudied is insomnia. Despite its prevalence, insomnia has been shown to significantly impact the clinical course of SZ, exacerbating symptoms and complicating treatment efforts [21].

In light of these considerations, this study aimed to early recognition and reducing suicidal ideas in SZ patients that will be reflected for the benefit of the patient in a more structured and suitable management plan.

This cross-sectional study included 210 cases meeting the DSM-5 criteria for SZ as a comprehensive sample.

Our demographic and disease-related results were consistent with Li, S.X. et al. [22] study, focusing on sleep disturbances and suicide risk within SZ cases, which revealed a slightly older mean age of 41.0 years among participants, with 54.9% of participants being female. The majority of cases were single (53.1%), 35.3% were married, and 11.6% were divorced or widowed (11.6%). Similarly, a significant portion of unemployed participants (67.8%) was noted in their study. Regarding educational background, their study demonstrated varied distributions, with 24.9% having primary education or below, 62.0% with secondary education, and 13.1% holding a college degree or above.

Regarding insomnia severity and associated factors in SZ cases, the distribution of patients based on their insomnia severity index showed a range from three to 27, with a median score of 17. Approximately 44% of patients had normal sleep, while 53.8% experienced moderate to severe insomnia, indicating a considerable variation in sleep patterns among individuals with SZ.

Our results align closely with the findings reported by Reeve et al. [4], who documented a prevalence rate of 50%. Moreover, the study by Doghramji et al. [23] provides further evidence of the high prevalence of insomnia in individuals with schizophrenia. Their findings indicate that 79.4% of the patients met the threshold criterion for insomnia based on their ISI scores. Conversely, Mondal et al. [24] demonstrated a lower incidence rate of

moderate to severe insomnia (29.2%), indicating a smaller proportion of individuals experiencing insomnia compared to our study and other cited research. These variations may stem from differences in sample characteristics. Furthermore, cultural, environmental, and regional factors may contribute to variations in the incidence and severity of insomnia symptoms among individuals with schizophrenia.

The current study demonstrated significant correlations between insomnia severity and various demographic factors. Older age was linked with moderate and severe insomnia, while males were more prevalent in the absent/subthreshold category while severe insomnia was more prevalent in Females.

These findings are supported by Batalla-Martín et al. [2], who observed a statistically significant higher average age among individuals with SZ and insomnia compared to those without insomnia (p= 0.003). Their analysis by age groups further demonstrated an increasing presence of the disorder with advancing age. Zhang and Wing [25] also noted age as a factor influencing insomnia presence.

Our findings also align with those of Zhu et al. [26], who also observed an elevated incidence of insomnia symptoms among female SZ cases compared to males (26.3% vs. 17.3%). Furthermore, their study revealed that cases with insomnia had a significantly later age of onset (p = 0.036).

In this study, a significant relationship was demonstrated between insomnia severity and depression, with increasing severity of insomnia correlated with a raised depression incidence. Also, individuals with sub-threshold, moderate, or severe insomnia had significantly elevated odds of experiencing depression compared to those with absent insomnia, with the risk increasing substantially with the severity of insomnia.

Consistent with findings from Batalla-Martín et al., [2] found a raised likelihood of insomnia when depression and anxiety symptoms were present.

Likewise, our findings align with those of Xia et al. [27], who observed that patients with insomnia symptoms exhibited more depressive symptoms (CDSS) in comparison to those without insomnia.

The significant association observed between insomnia severity and depression in our study may be attributed to a variety of factors. Biologically, chronic insomnia can disrupt neurotransmitter systems responsible for mood regulation. Psychologically, persistent sleep difficulties may intensify negative emotions and cognitive impairments commonly associated with depression. Additionally, impaired stress regulation and shared risk factors between insomnia and depression could further reinforce this relationship. Zeng et al. [28]

The present study revealed significant relationships between insomnia severity and suicidal ideation and attempts, indicating that more severe insomnia was correlated with an increased prevalence of suicidal attempts and ideation among individuals with SZ.

In addition, increasing research suggests that insomnia may be a substantial predictor of suicidality in SZ cases [29–31].

This may be attributed to the bidirectional relationship between sleep disturbances and mental health. Insomnia is known to exacerbate psychiatric symptoms, including depression and anxiety, which are risk factors for suicidal ideation and behavior. Additionally, sleep disturbances can impair cognitive functioning and emotional regulation, making it more challenging for individuals to cope with distressing thoughts and impulses. Conversely, the distress caused by suicidal ideation and attempts can further disrupt sleep patterns, leading to a vicious cycle of sleep disturbances and worsening mental health outcomes. Moreover, the shared underlying neurobiological mechanisms implicated in both insomnia and suicidal behavior, such as dysregulation of the hypothalamic-pituitary-adrenal axis and alterations in neurotransmitter systems, may contribute to their co-occurrence in individuals with schizophrenia [23].

In contrast, a previous study by Brian J Miller et al. [32] of patients with SZ indicated that different insomnia symptoms exhibited varying degrees of association with psychiatric symptoms and suicidality. They found that only terminal insomnia was

independently associated with worsening symptoms and current suicidal ideation, whereas only initial/middle insomnia was associated with suicidal attempts.

In line with our results concerning insomnia severity association with other data, Batalla-Martín et al. [2] revealed age as a significant factor influencing insomnia presence, with a higher average age among affected individuals. Additionally, Zhu et al. [26] identified significant associations between insomnia severity and demographic factors such as gender (female) and age (old), indicating the influence of these variables on the severity of insomnia among SZ cases. Taken together, these findings suggest that older age and female gender may be risk factors for sleep disturbances in patients with chronic schizophrenia. A possible explanation for the female gender is the role of sex hormones. Studies have shown that female sex hormone fluctuations are closely related to sleep complaints, such as in adolescence and menopause [1].

The current study reported a significant incidence of depressive symptoms among individuals with SZ, with approximately 46% of patients exhibiting symptoms of depression based on their CDSS.

This finding aligns with previous research by Xu et al. [33] reported a notable finding that 41.8% of SZ cases reported depression. Additionally, Arraras et al. [34] reported that 43.9% of participants were identified as having major depressive disorder (MDD) using CDSS.

Conversely, Dai et al. [35] found that among their study participants, 131 patients scored 8 or more points on the Hamilton Rating Scale for Depression (HAMD-17), indicating an incidence of comorbid depressive symptoms of 54.6%. So, it's important to note the wide range of reported rates of depression in SZ cases. Also, the variations in prevalence estimates could stem from differences in assessment tools and sample characteristics, highlighting the need for standardized assessment methods and consideration of contextual factors in interpreting prevalence rates.

In our study, we observed a notable prevalence of suicidal ideation among participants, indicating that a substantial proportion of individuals experienced thoughts or intentions related to self-harm or suicide. Specifically, 33.8% of participants presented with suicidal ideation, as assessed by Beck's suicide ideation scale. The median Beck's suicide ideation score ranged from 0 to 32, indicating varying levels of suicidal ideation among individuals with SZ.

In line with our results, Andriopoulos et al. [36] reported that suicide ideation and attempts during the prodromal period were observed in 25.5%. These rates were 3.8-fold greater than those observed in the controls.

However, Brian J. Miller et al. [32] found that forty subjects, constituting 12.1% of the sample, endorsed suicidal ideation, which is lower than the prevalence observed in our study.

The study may explain this didn't use a scale for suicide but used a single question about having suicidal ideation or not.

In our study, suicide-related variables revealed that approximately 77.1% of patients had no history of suicide attempts, while 22.9% reported attempting suicide at least once.

Woottiluk et al. [37] found a high suicidality incidence among SZ cases, estimated at 19.6%.

In contrast, McGrath et al. [38] emphasized that suicidal behavior is a common cause of early mortality, influencing about 5% of SZ cases, which is relatively lower than our results.

In our study, patients reporting suicidal ideation exhibited a higher number of hospitalizations and greater severity of positive, negative, and general symptoms compared to those without suicidal ideation. Importantly, multivariate regression analysis identified positive PANSS symptoms and severe insomnia as significant independent predictors of suicidal ideation, highlighting the role of psychiatric symptoms and sleep disturbances in suicidal behavior among individuals with SZ. These findings align with the results of Lucas et al. [39], who found evidence supporting a relationship between caffeine consumption and a reduced suicide risk in large cohorts.

Conversely, While our study did not find

significant associations with age or sex, Woottiluk et al. [37] reported a slightly elevated suicide risk among females and identified younger age as a factor associated with increased suicide risk. So, we have to search for suicide risk in all age and sex groups.

Our study underscores a substantial correlation between depression and suicidal ideation and attempts among SZ cases. Those suffering from depression were significantly more inclined to report suicidal thoughts and engage in attempts compared to their counterparts without depression.

Sher and Khan [40] also emphasize the heightened risk of suicidal behavior in concurrent depression and SZ cases, suggesting that antidepressants, in combination with antipsychotic drugs, may mitigate this risk.

Conclusion

There was a noteworthy association between the severity of insomnia and the propensity for suicidal ideation. Particularly concerning was the finding that individuals experiencing moderate to severe insomnia exhibited a significantly heightened risk of suicidal thoughts. Patients with more pronounced insomnia tended to exhibit heightened positive, negative, and general symptoms, indicating a potential exacerbating effect of sleep disturbances on the clinical presentation of SZ. These results highlight the imperative of incorporating sleep-focused interventions into the comprehensive management of SZ to alleviate symptom burden and enhance overall well-being.

REFERENCE

1. **Zhu R, Wang D, Tian Y, Du Y, Chen J, Zhou H, et al**. Sex difference in association between insomnia and cognitive impairment in patients with chronic schizophrenia. Schizophr Res. 2022;240:143–9.
2. **Batalla-Martín D, Belzunegui-Eraso A, Miralles Garijo E, Martínez Martín E, Romaní Garcia R, Heras JSM, et al.** Insomnia in Schizophrenia Patients: Prevalence and Quality of Life. Int J Environ Res Public Health. 2020;17:1350.
3. **Reeve S, Sheaves B, Freeman D**. Sleep Disorders in Early Psychosis: Incidence, Severity, and Association With Clinical Symptoms. Schizophr Bull. 2019;45:287–95.
4. **Reeve S, Nickless A, Sheaves B, Freeman D.** Insomnia, negative affect, and psychotic experiences: Modelling pathways over time in a clinical observational study. Psychiatry Res. 2018;269:673–80.
5. **Riecher-Rössler A, Butler S, Kulkarni J.** Sex and gender differences in schizophrenic psychoses-a critical review. Arch Womens Ment Health. 2018;21:627–48.
6. **Lee E, Ancoli-Israel S, Eyler L, Tu X, Palmer B, Irwin M, et al.** Sleep Disturbances and Inflammatory Biomarkers in Schizophrenia: Focus on Sex Differences. Am J Geriatr Psychiatry. 2019;27:21–31.
7. **Malik S, Kanwar A, Sim L, Prokop L, Wang Z, Benkhadra K, et al**. The association between sleep disturbances and suicidal behaviors in patients with psychiatric diagnoses: a systematic review and meta-analysis. Syst Rev. 2014;3:18.
8. **Lu L, Dong M, Zhang L, Zhu X, Ungvari S, Ng C, et al.** Prevalence of suicide attempts in individuals with schizophrenia: a meta-analysis of observational studies. Epidemiol Psychiatr Sci. 2019;29:e39.
9. **Miller BJ, McEvoy JP, McCall WV.** Insomnia, Suicidal Ideation, and Suicide Attempts in the Clinical Antipsychotic Trials of Intervention Effectiveness. J Clin Psychiatry. 2021;82:20m13338.
10. **American Psychiatric Association D**, American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. American psychiatric association Washington, DC; 2013.
11. **First M, Gibbon M.** The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) and the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II). Comprehensive handbook of psychological assessment, Personality assessment. Hoboken, NJ, US: John Wiley & Sons, Inc.; 2004;2:134–43.
12. **El Missiry A, Sorour A, Sadek A, Fahy T, Abdel Mawgoud M, Asaad T.** Homicide and psychiatric illness: an Egyptian study. MD thesis. 2003.
13. **Kay S, Fiszbein A, Opler L.** The positive and negative syndrome scale (PANSS) for schizophrenia. Schizophr Bull. 1987;13:261–76.
14. **Beck A, Steer R, Ranieri W**. Scale for Suicide Ideation: psychometric properties of a self-report version. J Clin Psychol. 1988;44:499–505.
15. **Cochrane-Brink K, Lofchy JS, Sakinofsky I**. Clinical rating scales in suicide risk assessment. Gen Hosp Psychiatry. 2000;22:445–51.
16. **Alsalman R, Alansari B.** Relationship of suicide ideation with depression and hopelessness. Eur Psychiatry. 2016;33:S597.
17. **Addington D, Addington J, Maticka-Tyndale E, Joyce J.** Reliability and validity of a depression rating scale for schizophrenics. Schizophr Res. 1992;6:201–8.
18. **Schennach-Wolff R, Obermeier M, Seemüller F, Jäger M, Messer T, Laux G, et al.** Evaluating depressive symptoms and their impact on outcome in schizophrenia applying the Calgary Depression Scale. Acta Psychiatr Scand. 2011;123:228–38.
19. **Bastien C, Vallières A, Morin CM.** Validation of

the Insomnia Severity Index as an outcome measure for insomnia research. Sleep Med. 2001;2:297–307.

20. **Suleiman K, Yates BC.** Translating the Insomnia Severity Index Into Arabic. J Nurs Scholarsh. 2011;43:49–53.

21. **Ketcham E, Schooler NR, Severe JB, Buckley PF, Miller BJ.** Longitudinal study of insomnia, suicidal ideation, and psychopathology in schizophrenia. Schizophr Res. 2024;267:34–8.

22. **Li S, Lam SP, Zhang J, Yu MWM, Chan JWY, Chan CSY, et al.** Sleep Disturbances and Suicide Risk in an 8-Year Longitudinal Study of Schizophrenia-Spectrum Disorders. Sleep. 2016;39:1275–82.

23. **Doghramji, K., Tanielian, M., Certa, K., & Zhan, T. (2018).** Severity, Prevalence, Predictors, and Rate of Iden fica on of Insomnia Symptoms in a Sample of Hospitalized Psychiatric Pa ents. The Journal of nervous and mental disease, 206(10).

24. **Mondal G, Bajaj V, Goyal BL, Mukherjee N**. Prevalence of sleep disorders and severity of insomnia in psychiatric outpatients attending a tertiary level mental health care facility in Punjab, India. Asian J Psychiatr. 2018;32:8–13.

25. **Zhang B, Wing Y-K.** Sex differences in insomnia: a meta-analysis. Sleep. 2006;29:85–93.

26. **Zhu R, Wang D, Zhou H, Wang W, Wei S, Chen D, et al**. Sex differences in prevalence and clinical correlates of insomnia in Chinese patients with chronic schizophrenia. Eur Arch Psychiatry Clin Neurosci. 2023;273:601–11.

27. **Xia L, Zhong Y, Liu Z, Zhang Y, Li W, Wang Y, et al**. Insomnia Symptoms in Chinese Patients with Chronic Schizophrenia: Prevalence, Clinical Correlates and Relationship with Inflammation. 2020

28. **Zeng Y, Li W, Chen X, You Z, Mai S, Lan X, Ning Y, Zhou Y**. Mediating effect of inflammation on the relationship between sleep disruption and suicidal ideation in major depressive disorder. Journal of Affective Disorders. 2024 .

29. **Zhang Y, Fang X, Tang B, Fan K, Wen N, Zhao K, et al.** Childhood Trauma and Insomnia Increase Suicidal Ideation in Schizophrenia Patients: A Cross-Sectional Study. Front Psychiatry. 2021;12:769743.

30. **Miller BJ, McEvoy JP, McCall WV**. Meta-analysis of clozapine and insomnia in schizophrenia. Schizophr Res. 2023;252:208–15.

31. **Peng P, Wang Q, Zhou Y, Hao Y, Chen S, Wu Q, et al.** Inter-relationships of insomnia and psychiatric symptoms with suicidal ideation among patients with chronic schizophrenia: A network perspective. Prog Neuropsychopharmacol Biol Psychiatry. 2024;129:110899.

32. **Miller BJ, McEvoy JP, McCall WV**. Insomnia, suicidal ideation, and suicide attempts in the clinical antipsychotic trials of intervention effectiveness. The Journal of clinical psychiatry. 2021 Mar 23;82(3):29490.

33. **Xu Y-M, Li F, Liu X-B, Zhong B-L.** Depressive symptoms in Chinese male inpatients with schizophrenia: Prevalence and clinical correlates. Psychiatry Res. 2018;264:380–4.

34. **Arraras JI, Ibañez B, Pereda N, Iribarren S, Basterra I.** The association of clinical insight and depression with quality of life in schizophrenia. Psychiatry Res. 2019;279:350–2.

35. **Dai J, Du X, Yin G, Zhang Y, Xia H, Li X, et al.** Prevalence, demographic and clinical features of comorbid depressive symptoms in drug naïve patients with schizophrenia presenting with first episode psychosis. Schizophr Res. 2018;193:182–7.

36. **Andriopoulos, I., Ellul, J., Skokou, M., & Beratis, S. (2011).** Suicidality in the "prodromal" phase of schizophrenia. Comprehensive Psychiatry, 52(5), 479-485.

37. **Woottiluk P, Maneeton B, Jaiyen N, Khemawichanurat W, Kawilapat S, Maneeton N**. Prevalence and associated factors of suicide among hospitalized schizophrenic patients. World J Clin Cases. 2020;8:757–70.

38. **McGrath J, Saha S, Chant D, Welham J.** Schizophrenia: a concise overview of incidence, prevalence, and mortality. Epidemiol Rev. 2008;30:67–76.

39. **Lucas M, O'Reilly EJ, Pan A, Mirzaei F, Willett WC, Okereke OI, et al.** Coffee, caffeine, and risk of completed suicide: results from three prospective cohorts of American adults. World J Biol Psychiatry. 2014;15:377–86.

40. **Sher L, Kahn RS.** Suicide in Schizophrenia: An Educational Overview. Medicina (Kaunas). 2019;55:361.

TS (1): Relation between insomnia severity and baseline data of studied patients:

	Insomnia			χ^2	p
	Absent and subthreshold N=97(%)	**Moderate N=73 (%)**	**Severe N=40(%)**		
Age (year) [mean ± SD]	33.92 ± 7.01	38.21 ± 11.21	40.2 ± 13.03	7.134¥	0.001**
Bonferroni	P_1 0.017*	P_2 0.924	P_3 0.003*		
Sex: **Male** **Female**	**62 (54.4%)** **35 (36.5%)**	34 (29.8%) 39 (40.6%)	18 (15.8%) 22 (22.9%)	5.626	0.018*
Residence: **Urban** **Rural**	**39 (52.7%)** **58 (42.6%)**	27 (36.5%) 46 (33.8%)	**8 (10.8%)** **32 (23.5%)**	4.275	0.039*
Occupation **Employed** **Unemployed/housewife**	**34 (65.4%)** **63 (39.9%)**	10 (19.2%) 63 (39.9%)	**8 (15.4%)** **32 (20.3%)**	6.21	0.013*
Marital status **Single** **Married** **Widow** **Divorced**	55 (53.9%) 38 (46.3%) 12 (12.5%) 2 (20%)	27 (26.5%) 32 (39%) 6 (37.5%) 8 (80%)	20 (19.6%) 12 (14.6%) 8 (50%) 0 (0%)	4.564	0.033*
Smoking **Non-smoker** **Smokers**	32 (45.7%) 65 (46.4%)	28 (40%) 45 (23.1%)	10 (14.3%) 30 (21.4%)	0.332	0.565
Coffee/tea drinkers **No** **Yes**	61 (53.5%) 36 (37.5%)	43 (37.7%) 30 (31.3%)	**10 (8.8%)** **30 (31.3%)**	13.275	<0.001**
	Median (IQR)	**Median (IQR)**	**Median (IQR)**	**KW**	**p**
Offspring (if present))	2(1 − 2)	2.5(2 − 3)	3(2 − 3)	13.189	<0.001**
Pairwise	P_1 0.023*	P_2 0.079	P_3 0.001**		

¥One way ANOVA test χ^2Chi square for trend test *p<0.05 is statistically significant **≤p0.001 is statistically highly significant
p1 difference between absent/subthreshold and moderate insomnia   p2 difference between moderate and severe insomnia   p3 difference between absent/subthreshold and severe insomnia

TS (2): Relation between depression and baseline, disease-specific, and suicide data of the studied patients:

			χ^2 No N=113 (%)	Depression Yes N=97 (%)
Age (year) [mean ± SD]	35.55 ± 8.2	37.84 ± 12.07	-1.579	0.116
Age of onset (year)	26.43 ± 5.98	25.8 ± 7.67	0.655	0.513
Sex: **Male** **Female**	71 (62.3%) 42 (43.8%)	43 (37.7%) 54 (56.2%)	7.2	0.007*
Residence: **Urban** **Rural**	44 (59.5%) 69 (50.7%)	30 (40.5%) 67 (49.3%)	1.486	0.226
Occupation **Employed** **Unemployed/housewife**	36 (69.2%) 77 (48.7%)	16 (30.8%) 81 (51.3%)	6.613	0.01*
Marital status **Single** **Married** **Widow** **Divorced**	49 (48%) 58 (70.7%) 2 (12.5%) 4 (40%)	53 (52%) 24 (29.3%) 14 (87.5%) 6 (60%)	0.354	0.552
Smoking **Non-smoker** **Smokers**	41 (58.6%) 72 (51.4%)	29 (41.4%) 68 (48.6%)	0.958	0.328
Coffee/tea drinkers **No** **Yes**	71 (62.3%) 42 (43.8%)	43 (37.7%) 54 (56.2%)	7.2	0.007*

¥Independent sample t test χ^2Chi square test   §Chi square for trend test *p<0.05 is statistically significant **≤p0.001 is statistically highly significant Z Mann Whitney test

TS (3): Relation between suicidal ideation and baseline data of the studied patients:

	Suicidal ideation		χ^2	p
	No **N=139 (%)**	**Yes** **N=71 (%)**		
Age (year) [**mean ± SD**]	36.94 ± 8.5	35.96 ± 12.96	0.575	0.566
Sex: **Male** **Female**	71 (62.3%) 68 (70.8%)	43 (37.7%) 28 (29.2%)	1.703	0.192
Residence: **Urban** **Rural**	55 (74.3%) 84 (61.8%)	19 (25.7%) 52 (38.2%)	3.378	0.066
Education **Illiterate** **Read and write** **Primary education** **Secondary education** **High education**	15 (62.5%) 5 (50%) 17 (65.4%) 76 (71.7%) 26 (59.1%)	9 (37.5%) 5 (50%) 9 (34.6%) 30 (28.3%) 18 (40.9%)	0.132	0.717
Occupation **Employed** **Unemployed/housewife**	38 (73.1%) 101 (63.9%)	14 (26.9%) 57 (36.1%)	1.456	0.226
Marital status **Single** **Married** **Widow** **Divorced**	64 (62.7%) 61 (74.4%) 8 (50%) 6 (60%)	38 (37.3%) 21 (25.6%) 8 (50%) 4 (40%)	5.05	0.168
Smoking **Non-smoker** **Smokers**	44 (62.9%) 95 (67.9%)	26 (37.1%) 45 (32.1%)	0.521	0.47
Coffee/tea drinkers **No** **Yes**	83 (72.8%) 56 (58.3%)	31 (27.2%) 40 (41.7%)	4.878	**0.027***
	Median (IQR)	**Median (IQR)**	Z	p
Offspring (if present)	2(2 – 3)	3(2 – 3)	-0.68	0.497
¥Independent sample t test χ^2Chi square test §Chi square for trend test *p<0.05 is statistically significant **≤p0.001 is statistically highly significant Z Mann Whitney test				