Research Article

International Journal of Alzheimer's Disease Research

Risk Factors and War-Related Exposures Associated with Schizophrenia among Hospitalized Patients in Sana'a, Yemen: A Cross-Sectional Study

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Submitted: 2026, Mar 17; **Accepted:** 2026, Apr 24; **Published:** 2026, May 13

Citation: Al-Khorasani, A. A. A., Al-Zaazaai, A. A., Muqaddar, M. A., Alrumaim, M. A., Abdulrahman, M., et al. (2026). Risk Factors and War-Related Exposures Associated with Schizophrenia among Hospitalized Patients in Sana'a, Yemen: A Cross-Sectional Study. *Int J Alzheimers Dis Res, 4*(1), 01-10.

Abstract

Background: *Schizophrenia is a chronic psychiatric disorder with multifactorial etiology. In conflict-affected countries such as Yemen, prolonged war exposure may modify the risk profile of schizophrenia; however, empirical data remain scarce.*

Objectives: *To identify socio-demographic, clinical, behavioral, genetic, and war-related risk factors associated with schizophrenia among hospitalized patients in Sana'a, Yemen.*

Methods: *A hospital-based analytical cross-sectional study was conducted at Al-Amal Psychiatric Hospital, Sana'a, including 150 patients with confirmed schizophrenia admitted during 2023. Data were collected using medical records and structured questionnaires. Descriptive statistics, chi-square tests, and logistic regression analyses were performed.*

Results: *All participants were male; most were aged 20–39 years. Positive psychotic symptoms were highly prevalent. Significant risk factors included cannabis use (OR = 3.4, $p < 0.001$), khat chewing (OR = 2.9, $p = 0.001$), cigarette smoking (OR = 2.1, $p = 0.007$), family history of schizophrenia (OR = 2.6, $p = 0.002$), childhood trauma (OR = 2.5, $p = 0.013$), and war-related exposures such as direct bombing and forced displacement. More than half of patients achieved clinical remission; however, 34% developed significant complications.*

Conclusion: *Schizophrenia among hospitalized patients in Yemen is strongly associated with substance use, genetic vulnerability, childhood trauma, and prolonged exposure to armed conflict. These findings highlight the need for trauma-informed mental health services in conflict-affected settings.*

Keywords: Schizophrenia, War-Related Trauma, Risk Factors, Yemen, Conflict Psychiatry, Psychotic Disorders, Mental Health, Unemployment, Genetic Predisposition, Internal Displacement, Substance Use, Socioeconomic Status, Treatment Outcomes

1. Introduction

Schizophrenia is a chronic and severe psychiatric disorder affecting about 1% of the global population and is a major contributor to disability worldwide [1,2]. Its etiology is multifactorial, involving a complex interaction between genetic predisposition and environmental risk factors [3,4].

Substance use is one of the most important modifiable risk factors, with strong evidence linking cannabis use to increased risk of schizophrenia, particularly among vulnerable individuals [5]. Other behavioral factors such as cigarette smoking and khat chewing have also been associated with worsening psychotic symptoms and disease progression [6,7]. In addition, early-life adversities, including childhood trauma, play a significant role in increasing susceptibility to psychosis by affecting neurodevelopment [8].

Exposure to war and conflict has emerged as an important environmental risk factor for mental disorders. Individuals living in conflict settings are frequently exposed to traumatic events such as violence, displacement, and loss, which may increase the risk of developing psychotic disorders [9,10]. Yemen, affected by ongoing armed conflict since 2015, represents a unique context where prolonged exposure to such stressors may influence the epidemiology of schizophrenia [11].

Despite this, there is limited research exploring the relationship between war-related exposures and schizophrenia in Yemen. Therefore, this study aims to identify socio-demographic, clinical, behavioral, genetic, and war-related risk factors associated with schizophrenia among hospitalized patients in Sana'a.

2. Methods

2.1. Study Design: Hospital-based analytical cross-sectional study.

2.2. Setting: Al-Amal Psychiatric Hospital, Sana'a, Yemen.

2.3. Participants: 150 hospitalized patients with confirmed schizophrenia diagnosis (DSM-5 / ICD-11).

2.4. Data Collection: Sociodemographic, clinical features, comorbidities, behavioral factors, family history, childhood trauma, and war-related exposures.

2.5. Statistical Analysis: SPSS v26; chi-square and logistic regression; $p < 0.05$ considered significant.

3. Results

A total of about 7000 patients were admitted and discharged from Al-Amal Psychiatric Hospital from 01/01/2023–12/31/2023. Of admitted patients, about 4000 patients have schizophrenia during their hospitalization. So, the estimated incidence of schizophrenia is 57% (n = 4000/7000).

4. Distribution of the Sample according to Socio-demographic characteristics:

4.1. Distribution of the Sample according to sex:

Table (1) shows the distribution of the study sample according to sex. All participants included in the study were male patients, accounting for 100% (n = 150) of the sample, while no female patients (0%) were included.

This reflects that schizophrenia admissions during the study period at Al-Amal Psychiatric Hospital were exclusively among males, which may be attributed to cultural, social, or institutional factors affecting hospital admission patterns.

Sex	N	%
Male	150	100.0%
Female	0	0.0%
Total	150	100.0%

Table 1: Distribution of the Study Sample According to Sex

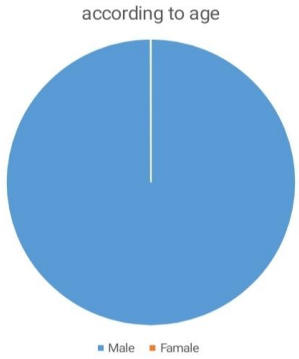

Figure 1: Distribution of the Study Sample According to Sex

4.2. Distribution of the Sample according to age group:

Table (2) demonstrates the age distribution of the studied patients. The majority of patients were within the 30–39 years age group, representing 49.3% (n = 74) of the total sample. This was followed by the 20–29 years age group, which accounted for 32.6% (n = 49). Patients aged over 40 years constituted 10% (n = 15), while the youngest age group 10–19 years represented the smallest proportion at 8% (n = 12). Overall, these findings indicate that schizophrenia was most prevalent among patients in early and middle adulthood, particularly between 20 and 39 years, which aligns with the commonly reported age of onset for schizophrenia.

Age	N	%
10 to 19 yrs.	12	8%
20 to 29 yrs.	49	32.6%
30 to 39 yrs.	74	49.3%
> 40 yrs	15	10%
Total	150	100.0%

Table 2: Distribution of the Study Sample According to Age Groups

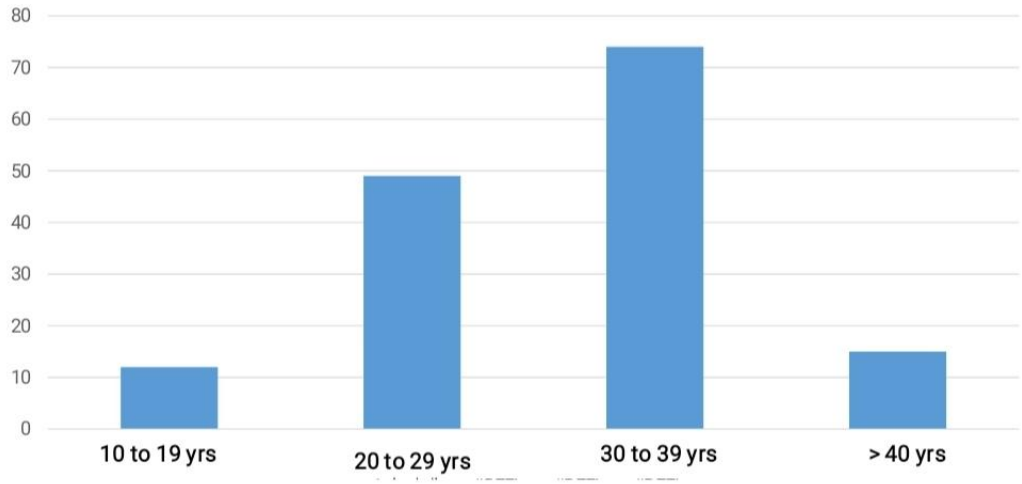

Figure 2: Distribution of the Study Sample According to Age Groups

4.3. Distribution of the Sample according to place of birth

Table (3) illustrates the distribution of the study sample according to place of birth. The highest proportion of patients were born in Sana'a Governorate, accounting for 24% (n = 36) of the total sample. This was followed by Dhamar Governorate at 12.7% (n = 19) and Ibb Governorate at 12% (n = 18). Patients from Sa'adah Governorate represented 10.7% (n = 16), while those from Taiz and Hajjah Governorates accounted for 8.6% (n = 13) and 8% (n = 12) respectively. Lower proportions were observed among patients born in Al-Bayda, Amran, Al-Hudaydah, and Aden Governorates. Patients from other governorates constituted 4% (n = 6) of the total sample. Overall, the findings indicate that most admitted schizophrenia patients originated from governorates geographically closer to Sana'a, which may reflect referral patterns and accessibility to Al-Amal Psychiatric Hospital.

	Place of birth	N	%
1	**Sana'a Governorate**	36	24%
2	**Dhamar Governorate**	19	12.7%
3	**Ibb Governorate**	18	12%
4	**Sa'adah Governorate**	16	10.7%
5	**Taiz Governorate**	13	8.6%
6	**Hajjah Governorate**	12	8%

7	**Al-Bayda Governorate**	11	7.3%
8	**Amran Governorate**	8	5.3%
9	**Al Hudaydah Governorate**	7	4.7%
10	**Aden Governorate**	4	2.7%
11	**Others**	6	4%
	Total	150	100.0%

Table 3: Distribution of the Study Sample According to Place of Birth

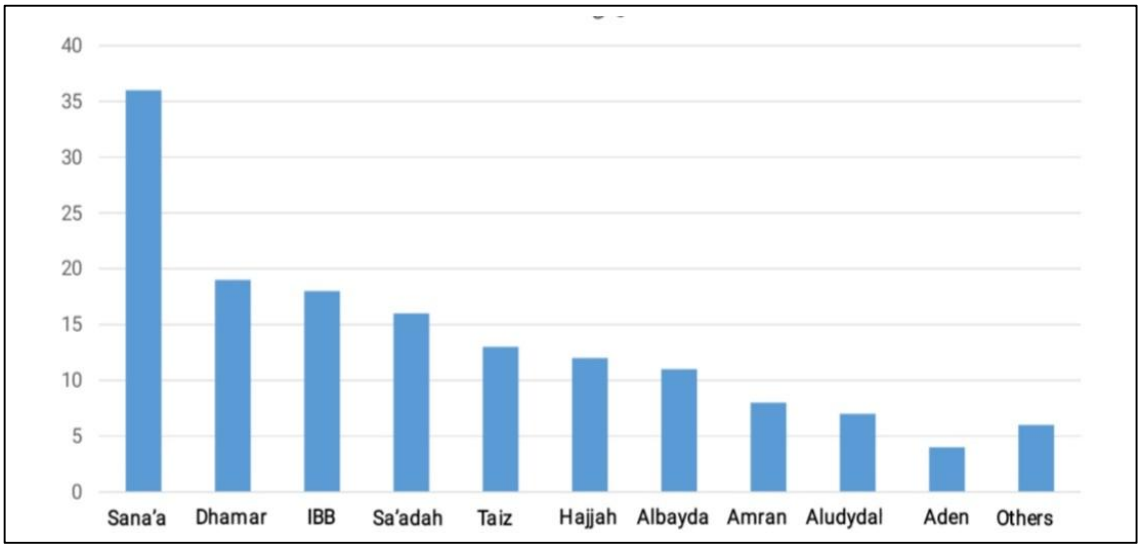

Figure 3: Distribution of the Study Sample According to Place of Birth

4.4. Distribution of the Sample according to Occupation:

Table (4) presents the occupational status of the studied patients. The majority of patients were unemployed, representing 37.3% (n = 56) of the total sample. This was followed by government employees, who constituted 29.3% (n = 44). Laborers accounted for 18.7% (n = 28), while students represented 8% (n = 12). A smaller proportion of patients were classified under other occupations (6.7%, n = 10). Notably, no housewives (0%) were included in the sample, which is consistent with the exclusively male study population. These findings suggest a high prevalence of schizophrenia among individuals with unstable or low socioeconomic status, particularly among unemployed and laborer groups.

	Occupation	**N**	**%**
1	**Unemployed**	56	37.3%
2	**Government Employee**	44	29.3%
3	**Student**	12	8%
4	**Housewife**	0	0.0%
5	**Laborer**	28	18.7%
6	**Others**	10	6.7%
	Total	150	100.0%

Table 4: Distribution of the Study Sample According to Occupation

4.5. Distribution of the Sample according to current residence type:

Table (5) shows the distribution of patients according to their current residence type. The majority of the study participants were living in a family home, accounting for 83.4% (n = 125) of the sample. Patients residing in internally displaced persons (IDP) camps represented 11.3% (n = 17), while homeless individuals constituted 4% (n = 6). A very small proportion of patients were

living in collective shelters, accounting for only 1.3% (n = 2). These findings indicate that although most patients lived within a family environment, a considerable proportion were affected by displacement and unstable living conditions, which may contribute to psychological stress and increased vulnerability to schizophrenia.

	Current Residence	N	%
1	Family home	125	83.4%
2	IDP camp	17	11.3%
3	Collective Shelter	2	1.3%
4	Homeless	6	4%
	Total	150	100.0%

Table 5: Distribution of the Study Sample According to Current Residence Type

4.6. Distribution of the Sample according to the displacement status:

Table (6) illustrates the displacement status of the studied patients. Nearly two-thirds of the participants were local residents, representing 63.3% (n = 95). In contrast, internally displaced persons (IDPs) constituted a substantial proportion, accounting for 35.4% (n = 53) of the sample. Only a small fraction of patients was classified as refugees, representing 1.3% (n = 2). These results reflect the significant impact of internal displacement due to ongoing conflict on mental health, highlighting displacement as a potential risk factor for schizophrenia among admitted patients.

Displacement status	N	%
Internally Displayed IPD	53	35.4%
Refuge	2	1.3%
Local resident	95	63.3%
Total	150	100.0%

Table 6: Distribution of the Study Sample According to Displacement Status

4.7. Distribution of the Sample according to educational level:

Table (7) presents the educational level of the study participants. The highest proportion of patients had a secondary level of education, accounting for 35.3% (n = 53) of the sample. This was followed by those with a university education, who represented 25.3% (n = 38). Patients with primary education constituted 20.7% (n = 31), while illiterate patients accounted for 18.7% (n = 28). Overall, more than half of the patients had an educational level of secondary school or higher. These findings suggest that schizophrenia affects individuals across different educational levels, with a noticeable burden among those with moderate to higher education.

Education Level	N	%
Illiterate	28	18.7%
Primary	31	20.7%
Secondary	53	35.3%
University	38	25.3%
Total	150	100.0%

Table 7: Distribution of the Study Sample According to Educational Level

4.8. Distribution of the Sample according to schizophrenia symptoms:

Table (8) presents the distribution of schizophrenia symptoms and their severity among the studied patients. Delusions were present in the majority of patients, affecting 95.3% (n = 143) of the sample. Among those patients, more than half exhibited severe delusions, accounting for 51.1% (n = 73), while 43.3% (n = 62) had moderate severity and only 5.6% (n = 8) had mild symptoms. Hallucinations were the most prevalent symptom, reported in 97.3% (n = 146) of patients. The severity of hallucinations was predominantly severe, affecting 66.5% (n = 97) of cases, followed by moderate severity in 30.1% (n = 44). Mild hallucinations were uncommon (3.4%, n = 5).

Disorganized thinking was observed in 76% (n = 114) of patients. Nearly half of these patients had moderate severity (48.2%, n = 55), while 31.5% (n = 36) exhibited mild symptoms and 19.3% (n = 22) had severe disorganization. Disorganized behavior was present in 59.3% (n = 89) of the sample. Most affected patients showed moderate severity (48.3%, n = 43), followed by mild (32.6%, n = 29) and severe symptoms (19.1%, n = 17). Negative symptoms were identified in 54.7% (n = 82) of patients. The majority of these cases were of mild severity (57.3%, n = 47), while 36.6% (n = 30) had moderate symptoms and only 6.1% (n = 5) experienced severe negative symptoms. Finally, cognitive symptoms were present in 48% (n = 72) of the study population. Among them, 45.8% (n = 33) had moderate severity, 31.9% (n = 23) had mild symptoms, and 22.3% (n = 16) exhibited severe cognitive impairment. Overall, positive symptoms (delusions and hallucinations) were more prevalent and severe compared to negative and cognitive symptoms, indicating that most patients were admitted during an acute psychotic phase.

	Symptoms	N	%	Severity	N	%	
1	**Delusions**	**Yes**	143	95.3%	Mild	8	5.6%
					Modrate	62	43.3%
					Severe	73	51.1%
		No	7	4.7%			
2	**Hallucinations**	**Yes**	146	97.3%	Mild	5	3.4%
					Modrate	44	30.1%
					Severe	97	66.5%
		No	4	2.7%			
3	**Disorganized thinking**	**Yes**	114	76%	Mild	36	31.5%
					Moderate	55	48.2%
					Severe	22	19.3%
		No	36	24%			
4	**Disorganized behavior**	**Yes**	89	59.3%	Mild	29	32.6%
					Moderate	43	48.3%
					Severe	17	19.1%
		No	61	40.7%			
5	**Negative symptoms**	**Yes**	82	54.7%	Mild	47	57.3%
					Moderate	30	36.6%
					Severe	5	6.1%
		No	68	45.3%			
6	**Cognitive symptoms**	**Yes**	72	48%	Mild	23	31.9%
					Moderate	33	45.8%
					Severe	16	22.3%
		No	78	52%			

Table 8: Distribution of Schizophrenia Symptoms and Their Severity among the Study Sample

4.9. Distribution of the Sample according to comorbid disorders

Table (11) presents the demographic and socioeconomic characteristics of patients with schizophrenia. Regarding marital status, the majority of patients were married, accounting for 68% (n = 102), while single patients represented 23.3% (n = 35) and divorced patients constituted 8.7% (n = 13). In terms of residence, more than half of the patients lived in urban areas (59.3%, n = 89), followed by rural residents (29.3%, n = 44) and those living in camps (11.4%, n = 17). Concerning housing status, 47.3% (n = 71) of patients lived in rented housing, while 46.7% (n = 70) owned their homes. A small proportion (6%, n = 9) lived in free housing. With regard to income level, more than half of the patients had a low income (54.7%, n = 82), while 36.7% (n = 55) had a moderate income and only 8.6% (n = 13) reported a high income. Table (11) shows paternal characteristics and season of birth of the studied patients. Most patients had an adult father at the time of birth, accounting for 85.3% (n = 128), while 8.7% (n = 13) had a young father and 6% (n = 9) had unknown paternal age. Regarding paternal socioeconomic status, 45.3% (n = 68) of patients belonged to a moderate socioeconomic background, followed by 40.7% (n = 61) with low status and 14% (n = 21) with high status. As for the season of birth, the highest proportion of patients were born in winter, accounting for 53.3% (n = 80). This was followed by

autumn (18.7%, n = 28), spring (12%, n = 18), and summer (6%, n = 9), while 10% (n = 15) had an unknown season of birth. These findings support previously reported seasonal variation in the birth of patients with schizophrenia.

Risk Factors		N	%
Marital Status	Single	35	23.3%
	Married	102	68%
	Divorced	13	8.7%
	Total	150	100.0%
Residence	Urban	89	59.3%
	Rural	44	29.3%
	Camp	17	11.4%
	Total	150	100.0%
Housing	Rent	71	47.3%
	Own	70	46.7%
	Free housing	9	6%
	Total	150	100.0%
Income	Low	82	54.7%
	Modrate	55	36.7%
	High	13	8.6%
	Total	150	100.0%
Paternal age	Young	13	8.7%
	Adult	128	85.3%
	Unknown	9	6%
	Total	150	100.0%
Paternal Socioeconomic status	Low	61	40.7%
	Modrate	68	45.3%
	High	21	14%
	Total	150	100.0%
Season of birth	Spring	18	12%
	Winter	80	53.3%
	Summer	9	6%
	Autumn	28	18.7%
	Unknown	15	10%
	Total	150	100.0%

Table 11: Demographic and Socioeconomic Characteristics of the Study Sample

4.10. Distribution of the Sample according to treatment modalities:

This table illustrates the treatment modalities received by patients admitted with schizophrenia. Almost all patients received antipsychotic medications, accounting for 98.7% (n = 148), while only 1.3% (n = 2) did not receive pharmacological treatment. Regarding hospital stay, the majority of patients (92%, n = 138) required inpatient admission, whereas 3.3% (n = 5) were not admitted, and 4.7% (n = 7) had unknown admission status.

All patients (100%, n = 150) received some form of psychological intervention, indicating comprehensive psychosocial management during hospitalization. Electroconvulsive therapy (ECT) was administered to 20.7% (n = 31) of patients, while 77.3% (n = 116) did not receive ECT, and 2% (n = 3) had unknown ECT status. These findings demonstrate that pharmacological treatment combined with psychological interventions constituted the mainstay of schizophrenia management, with selective use of ECT in severe or treatment-resistant cases.

N	Treatment		Yes	No	Unknown	Total
1	Medicine (Antipsychotic)	N	148	2	0	150
		%	98.7%	1.3%	0.0%	100.0%
2	Hospital stay	N	138	5	7	150
		%	92%	3.3%	4.7%	100.0%
3	Psychological intervention	N	150	0	0	150
		%	100.0%	0.0%	0.0%	100.0%
4	Electroconvulsive Therapy	N	31	116	3	150
		%	20.7%	77.3%	2%	100.0%

Table 12: Treatment Modalities among the Study Sample

4.11. Distribution of the Sample according to treatment outcomes:

Table (13) presents the clinical outcomes of patients following treatment. More than half of the patients achieved complete remission of symptoms, accounting for 57.4% (n = 86). However, 25.3% (n = 38) of patients experienced worsening of symptoms during the course of treatment. A smaller proportion of patients were referred to another healthcare facility (5.3%, n = 8), while 12% (n = 18) were discharged against medical advice (DAMA). Overall, these results indicate that the majority of patients responded favorably to treatment, although a considerable proportion exhibited poor outcomes or interrupted care.

	Outcomes	N	%
1	Complete remission of symptoms	86	57.4%
2	Worsening symptoms	38	25.3%
3	Referred to other facility	8	5.3%
4	Discharged DAMA	18	12%
	Total	150	100.0%

Table 13: Treatment Outcomes among the Study Sample

Table (14) shows the occurrence of complications among the studied patients.

Complications were reported in 34% (n = 51) of patients, while the majority (66%, n = 99) experienced no complications during their hospital stay. This suggests that although most patients had an uncomplicated clinical course, a significant proportion developed complications requiring careful monitoring and intervention.

	Complications	N	%
1	Yes	51	34%
2	No	99	66%
	Total	150	100.0%

Table 14: Overall Complications among the Study Sample

Table (15) describes the types of complications observed among patients with schizophrenia. Suicidal ideation was reported in 19.3% (n = 29) of patients, while suicide attempts occurred in 16.7% (n = 25). Completed suicide was documented in 14.7% (n = 22) of cases. In addition, anxiety disorders were observed in 14% (n = 21) of patients, while obsessive-compulsive disorder (OCD) was reported in 8% (n = 12). These findings highlight the high burden of suicidality and comorbid psychiatric conditions among patients with schizophrenia, underscoring the need for early detection, continuous risk assessment, and integrated mental health care.

	Complications	N	%
1	Suicide	22	14.7%
2	Suicide attempts	25	16.7
3	Thinks of suicide	29	19.3%
4	Anxiety disorders	21	14%
5	Obsessive-Compulsive Disorder	12	8%

Table 15: Types of Complications Observed among Patients

5. Discussion

This study highlights a high burden of schizophrenia among hospitalized patients in Sana'a, with an estimated proportion of 57% of total admissions, reflecting the concentration of severe cases in psychiatric facilities rather than true population prevalence [12]. All participants in this study were male, which contrasts with global findings showing that schizophrenia affects both sexes. This may be explained by sociocultural barriers and limited access to mental health services for females in Yemen [13,14]. The majority of patients were aged between 20 and 39 years, consistent with the typical age of onset reported in previous studies [15]. Socioeconomic factors were prominent, as a large proportion of patients were unemployed and had low income. This supports existing evidence linking socioeconomic disadvantage with increased risk of schizophrenia and poorer outcomes [16,17]. Additionally, a considerable number of patients were internally displaced or living in unstable conditions, reflecting the impact of ongoing conflict. War-related stressors such as displacement and insecurity are well-documented contributors to mental disorders, including psychosis [18,19]. Clinically, positive symptoms (hallucinations and delusions) were highly prevalent and often severe, indicating that most patients were admitted during acute psychotic episodes, which aligns with hospital-based studies [20]. Negative and cognitive symptoms were less prominent. The study also observed a higher proportion of patients born in winter, supporting previous evidence of seasonal variation in schizophrenia, possibly linked to prenatal environmental factors [21]. Furthermore, substance use (such as khat, smoking, and cannabis) remains an important contributing factor, as reported in the literature [22].

Regarding management, most patients received antipsychotic treatment and psychological interventions, with more than half achieving remission. However, a notable proportion experienced poor outcomes or discontinued care, highlighting gaps in long-term management. The high rates of suicidal ideation and attempts are consistent with global data showing increased suicide risk among patients with schizophrenia [23]. In conclusion, the findings emphasize the combined influence of socioeconomic conditions, substance use, and war-related exposures on schizophrenia in Yemen, underscoring the need for integrated and trauma-informed mental health services.

6. Conclusion

This study demonstrates that schizophrenia among hospitalized patients in Yemen is strongly associated with substance use, low socioeconomic status, and war-related exposures such as displacement. The predominance of acute symptoms and notable rates of complications highlight gaps in early detection and continuity of care. These findings emphasize the need for strengthened, trauma-informed mental health services in conflict settings.

Limitations

The cross-sectional design limits causal inference. The study was conducted in a single center and included only male patients, which may affect generalizability. Additionally, reliance on hospital-based data may overrepresent severe cases.

Recommendations

There is a need to expand mental health services, integrate trauma-focused care, and implement substance use prevention programs. Future research should include both genders and adopt longitudinal designs to better understand risk factors and outcomes.

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