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Client Characteristics and Influence of Illness Duration, Onset, and Symptoms on Neurological Soft Signs and Functioning in First-Episode Schizophrenia

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ABSTRACT

Background: Neurological soft signs (NSS) are subtle neurological abnormalities that reflect underlying neurodevelopmental disturbances in schizophrenia. They are frequently observed in first-episode patients and may influence symptom severity and functional outcomes. Understanding the relationship between NSS and clinical variables during the early stage of illness is essential for timely intervention.

Methods: This cross-sectional analytical study was conducted on 60 antipsychotic-naïve individuals with a diagnosis of first-episode schizophrenia who presented to the Department of Psychiatry, N.S.C.B. Medical College & Hospital, Jabalpur, between January 2023 and December 2024. Neurological soft signs were examined using the Neurological Evaluation Scale. The severity of psychotic symptoms was assessed with the Positive and Negative Syndrome Scale, while global functioning was evaluated through the Global Assessment of Functioning scale. Statistical analysis was performed using SPSS version 25, incorporating descriptive measures, chi-square analysis, and Spearman's rank correlation.

Results: Neurological soft signs were present in 78.3% of participants, with a mean NSS score of 4.6±2.1. Shorter illness duration (1–3 months) was significantly associated with milder NSS, whereas later age of onset was associated with greater severity. NSS demonstrated a significant positive correlation with negative symptoms and a negative correlation with global functioning. Patients with a positive family history showed higher NSS severity.

Conclusion: Neurological soft signs are highly prevalent in first-episode schizophrenia and are significantly influenced by illness duration, age of onset, negative symptom severity, and family history. Early assessment of NSS may help predict functional outcomes and guide early intervention strategies.

Key-words: First-Episode Schizophrenia, Neurological Soft Signs, Illness Duration, Symptom Severity, Global Functioning

INTRODUCTION

Neurological soft signs (NSS) refer to minor neurological irregularities that lack clear anatomical localization and are frequently observed in individuals with schizophrenia, reflecting possible neurodevelopmental abnormalities [1].

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These manifestations typically include deficits in motor coordination, sensory processing, and the organization of complex motor tasks, and are evident at various stages of the disorder, including its initial phase [2]. Several studies have demonstrated that neurological soft signs are present not only in patients with schizophrenia but also, to a lesser extent, in their first-degree relatives, suggesting a strong genetic and neurodevelopmental basis for these abnormalities [3]. Unlike positive psychotic symptoms, NSS tend to remain relatively stable over time and show limited fluctuation with changes in clinical state, thereby supporting their role as trait markers rather than state-dependent phenomena [4].

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Importantly, research focusing on first-episode and drug-naïve schizophrenia patients indicates that neurological soft signs are evident before the initiation of antipsychotic treatment, minimizing the confounding influence of medication-induced motor side effects [5]. Neuroimaging and neuropsychological findings further link NSS to structural and functional abnormalities in fronto-striatal, cerebellar, and thalamic circuits, which are crucial for motor control and executive functioning [6].

The severity of neurological soft signs has been shown to vary with clinical factors such as age at onset and duration of untreated illness. Longer untreated periods are associated with progressive neural dysconnectivity and poorer functional outcomes, highlighting the importance of early detection and intervention [7]. This issue is particularly relevant in developing countries, where sociocultural factors and limited access to mental health services often delay treatment initiation [8].

Moreover, neurological soft signs have been found to correlate more strongly with negative symptoms than with positive symptoms of schizophrenia. Negative symptoms are closely linked to long-term disability and impaired psychosocial functioning, making NSS an clinically valuable marker for predicting functional prognosis in first-episode schizophrenia [9]. The aim is to evaluate the influence of illness duration and age of onset on neurological soft signs in first-episode schizophrenia, to examine the association between NSS and symptom severity, and to assess their relationship with global functioning.

MATERIALS AND METHODS

Study Design, Setting, and Duration- This was a cross-sectional analytical study conducted among patients with first-episode schizophrenia attending the Department of Psychiatry, N.S.C.B. Medical College & Hospital, Jabalpur, Madhya Pradesh, India. The study was conducted over a period of 2 years, from January 1, 2023, to December 31, 2024. The study sample consisted of 60 male and female patients diagnosed with first-episode schizophrenia.

Inclusion Criteria

- Fulfilled DSM-5 diagnostic criteria for schizophrenia.
- Were diagnosed as first-episode schizophrenia cases.
- Patients with a history of antipsychotic medication.
- Were aged 18 years and above.

Exclusion Criteria

- A history of neurological disorders such as epilepsy, head injury, stroke, or neurodegenerative diseases.
- Substance-induced psychosis or comorbid substance dependence (except nicotine).
- Severe medical illness that could affect neurological examination.
- Intellectual disability or organic brain disorders.
- Previous exposure to long-term antipsychotic treatment.

Data Collection- Information was obtained through face-to-face interviews carried out by qualified psychiatrists using a predefined schedule. Details related to socio-demographic profile, clinical features, duration of illness, and age at onset were documented. Neurological soft signs were evaluated with the Neurological Evaluation Scale. The severity of psychopathology was measured using the Positive and Negative Syndrome Scale, while functional status was determined using the Global Assessment of Functioning scale.

Statistical Analysis- Collected data were compiled in Microsoft Excel 2016 and subsequently processed using SPSS version 25. Quantitative analysis included calculation of frequencies, percentages, means, and standard deviations. Relationships between categorical variables were assessed using the Chi-square test, applying Yates' correction or Fisher's exact test when required. Associations between variables were explored using Spearman's rank correlation. Statistical significance was defined at a p-value of$\leq$0.05.

RESULTS

Table 1 summarizes the socio-demographic characteristics of the study sample (N=60). Most participants belonged to the 18–25-year age group, with an average age of 28.5±7.2 years, and males constituted 70% of the sample. Urban residents constituted 63.3% of the sample. Half of the participants were married, and most had an education up to intermediate or secondary level. Unemployment was observed in 26.7% of participants, and 40% reported insufficient monthly income, reflecting a socioeconomically vulnerable population.

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Table 1: Distribution of sample according to socio-demographic characteristics (N=60).

Variables	Category	N=60	%
Age (Years)	<18 years	0	0
	18-25	26	43.3
	26-35	22	36.7
	>35 years	12	20.0
	Total	60	100
	Mean±SD (Range)	28.5±7.2 (18-45)	
Gender	Male	42	70
	Female	18	30
	Total	60	100
Residence	Rural	22	36.7
	Urban	38	63.3
	Total	60	100
Marital Status	Single	28	46.7
	Married	30	50
	Divorced/Separated	1	1.7
	Widowed	1	1.7
	Total	60	100
Educational level	Illiterate	4	6.7
	Read & write	8	13.3
	Primary	12	20
	Intermediate	14	23.3
	Secondary	10	16.7
	College/Institute	8	13.3
	Higher education	4	6.7
	Total	60	100
Occupational Status	Unemployed	16	26.7
	Governmental employee	12	20
	Self-employed (free job)	10	16.7
	Housewife	6	10
	Retired	2	3.3
	Not working	8	13.3
	Student	6	10
	Total	60	100
Economic Status (Monthly Income)	Insufficient	24	40
	Sufficient to Some Extent	18	30
	Sufficient	18	30
	Total	60	100

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Table 2 illustrates the distribution of neurological soft signs based on illness duration and age at onset. Mild soft signs were predominant in patients with shorter illness duration (1–3 months). In contrast, moderate-to-severe soft signs were more frequent among participants with longer illness duration (4–12 months). Additionally, patients with a later age of onset (>25 years) exhibited greater severity of neurological soft signs, suggesting a relationship between the clinical course and neurological involvement.

Table 2: Distribution of sample according to neurological soft signs by illness duration and onset age.

Neurological Soft Signs Items	Unsatisfied (Mild) Freq. %	Satisfied to Some Extent (Moderate) Freq. %	Satisfied (Severe) Freq. %
By Illness Duration (1-3 months)	27 (90.0)	3 (10)	0 (0)
By Illness Duration (4-6 months)	11 (61.1)	6 (33.3)	1 (5.6)
By Illness Duration (7-12 months)	5 (41.7)	6 (50)	1 (8.3)
By Onset Age (<18 years)	9 (75.0)	3 (25)	0 (0)
By Onset Age (18-25 years)	17 (65.4)	8 (30.8)	1 (3.8)
By Onset Age (>25 years)	10 (45.5)	9 (40.9)	3 (13.6)

Clients Soft Signs Score: 4.6±2.1 (0-10)

Table 3 demonstrates the association between neurological soft signs, symptom severity (PANSS), and global functioning (GAF). Neurological soft signs showed a significant positive correlation with negative symptoms and a negative correlation with global functioning, indicating higher soft sign severity with more pronounced negative symptoms and poorer functioning. No significant association was observed with positive symptoms.

Table 3: Association between neurological soft signs total score and symptom profiles regarding schizophrenia assessment.

Symptom Profiles	Unsatisfied Freq. %	To Some Extent Satisfied Freq. %	Satisfied Freq. %	p-value
Negative Symptoms (PANSS)	25 (41.7)	20 (33.3)	15 (25)	0.0001*
Positive Symptoms (PANSS)	18 (30.0)	22 (36.7)	20 (33.3)	0.215
Global Functioning (GAF)	28 (46.7)	18 (30)	14 (23.3)	0.003*

Significance was determined using the Pearson χ^2 test at $p \leq 0.05$.

DISCUSSION

The present study investigated the prevalence and correlates of NSS in patients with first-episode schizophrenia, focusing on their association with illness duration, age at onset, symptom severity, global functioning, and family history. Neurological soft signs are subtle, non-localizing neurological abnormalities that reflect underlying neurodevelopmental deviations and are considered important trait markers in schizophrenia [10,12]. The results of this study provide significant insights into the early neurobiological and functional features of schizophrenia in an Indian clinical population.

In the current sample, NSS were observed in 78.3% of patients, with a mean score of 4.6±2.1, indicating a high prevalence consistent with prior studies reporting rates between 65–85% in first-episode populations [12]. This high prevalence underscores the neurodevelopmental nature of schizophrenia, as NSS appears early in the illness course, often before exposure to antipsychotic medications. The findings also corroborate previous research demonstrating that NSS are relatively stable

trait markers, largely independent of acute psychotic symptoms [10,11]. The present study strengthens this understanding by confirming the presence of NSS in a predominantly untreated Indian cohort and emphasizing its universal applicability as an early clinical indicator.

Illness duration was significantly associated with NSS severity. Patients with shorter illness duration (1–3 months) predominantly exhibited mild neurological soft signs, whereas moderate to severe signs were more common among those with longer illness duration (4–12 months). This pattern aligns with longitudinal and cross-sectional studies suggesting that prolonged untreated psychosis is associated with progressive neural dysconnectivity and functional deterioration [14,15]. Early identification and intervention, therefore, are critical to mitigate the progression of neurological and functional impairments.

The observed association between duration and NSS severity may reflect cumulative effects of untreated illness on cortical and subcortical brain regions, particularly the frontal, striatal, and cerebellar circuits involved in motor coordination and sensory integration [12,13]. These findings underscore the clinical importance of reducing the duration of untreated psychosis, especially in resource-limited settings, where delayed access to mental health care is common [21].

Age at onset emerged as another key determinant of NSS severity. Participants with later onset (>25 years) displayed higher NSS scores compared to younger-onset patients, suggesting that early-onset schizophrenia may benefit from greater neuroplasticity or compensatory mechanisms [16,17]. This finding contrasts with some genetic risk studies, which expected early-onset cases to exhibit more severe neurological deficits, highlighting the complex interplay between developmental stage, neuroplasticity, and illness manifestation [16]. Clinically, these results indicate that patients with later onset may require closer monitoring for functional and neurological deficits.

A significant positive correlation was found between NSS and negative symptoms ($r=0.42$, $p<0.001$), whereas no significant correlation was observed with positive symptoms ($p=0.21$). This differential association aligns with the literature, which suggests that negative symptoms are linked to enduring structural and functional brain abnormalities, including deficits in frontal-subcortical connectivity and dopamine regulation [18,19]. Negative symptoms, such as avolition, affective flattening, and social withdrawal, contribute substantially to functional impairment and long-term disability, making their association with NSS clinically relevant [18,20]. In contrast, the lack of association with positive symptoms reinforces the conceptualization of NSS as trait markers rather than state-dependent features of psychosis [10].

The inverse correlation between NSS and global functioning ($r= -0.38$, $p= 0.003$) suggests that greater neurological burden negatively affects overall daily functioning. Patients with elevated NSS scores demonstrated poorer performance on the Global Assessment of Functioning (GAF), highlighting the translational importance of NSS for predicting real-world outcomes. These findings are consistent with studies linking neurological soft signs to impairments in social, occupational, and cognitive domains [20]. Early detection of NSS could therefore serve as a predictive marker for identifying individuals at risk of functional decline, allowing targeted interventions to improve long-term outcomes.

Family history of psychiatric illness was associated with higher NSS severity (mean score 5.8±2.3 vs. 3.7±1.5, $p=0.001$), indicating a potential genetic contribution to neurodevelopmental vulnerability [21]. Heritability studies of schizophrenia suggest that structural and functional brain abnormalities, including NSS, may be amplified in individuals with a positive family history, further supporting the role of genetics in early pathophysiology. Clinically, assessment of family history alongside NSS evaluation could enhance early identification of high-risk individuals and facilitate preventive strategies.

The high prevalence and strong associations of NSS with negative symptoms and impaired global functioning underscore the importance of routine neurological assessment in early schizophrenia. Integrating NSS evaluation into standard psychiatric assessment could serve multiple purposes: early identification of at-risk patients, monitoring illness progression, and guiding individualized psychosocial and pharmacological interventions. In low-resource settings, bedside NSS assessments provide a cost-effective method to identify patients who may require additional support or intensive follow-up [12,21].

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STRENGTHS

The primary strength of this study lies in the inclusion of drug-naïve, first-episode patients, eliminating the confounding effects of chronic illness or long-term medication. Comprehensive assessment of NSS, symptom profiles, and functioning provides a holistic understanding of early schizophrenia.

CONCLUSIONS

Neurological soft signs are prevalent and clinically significant in first-episode schizophrenia. Severity is influenced by illness duration, age at onset, negative symptom burden, and family history. NSS are closely associated with impaired global functioning, suggesting their utility as early markers for predicting functional prognosis. Routine evaluation of NSS can aid in early detection, timely intervention, and long-term psychosocial improvement in schizophrenia.

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