ORIGINAL RESEARCH

Exploring Sociodemographic Characteristics, Minor Physical Anomalies, and Soft Neurological Signs in Schizophrenia: A Case-Control Study

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ABSTRACT

Background: Schizophrenia is a complex psychiatric disorder with diverse manifestations and etiological factors. This study aimed to investigate the sociodemographic characteristics, minor physical anomalies (MPAs), and soft neurological signs (SNS) among individuals with schizophrenia.**Methods:**A total of 120 participants (60 cases and 60 controls) were recruited and assessed for sociodemographic variables, MPAs, and SNS. Statistical analyses, including correlation tests and chi-square tests, were conducted to explore relationships between variables.**Result:**The majority of participants were aged 20-30 years, with a higher proportion of males among cases. Lower socioeconomic status and unemployment were prevalent among both cases and controls. Significant differences in MPAs and SNS were observed between cases and controls, with cases exhibiting higher frequencies. Correlation tests revealed a positive relationship between PANSS and SNS. However, no significant correlation was found between age of onset and SNS or MPAs.**Conclusion:**This study highlights the importance of understanding the sociodemographic and neurological profile of individuals with schizophrenia. Further research is needed to elucidate the underlying mechanisms and implications for clinical practice.

Key words: Schizophrenia, sociodemographic characteristics, minor physical anomalies, soft neurological signs, psychiatric assessment, correlation analysis.

INTRODUCTION

Schizophrenia poses a formidable challenge within the realm of psychiatric disorders, characterized by its profound disruption of cognitive processes, emotions, perceptions, and behavior.[1] Typically emerging during late adolescence or early adulthood, this condition exerts a widespread impact, burdening individuals globally and placing significant strains on patients, their families, and healthcare systems.[2] Despite extensive research spanning decades, the underlying causes and mechanisms of schizophrenia remain elusive, impeding progress in the development of effective diagnostic methods and treatment modalities.[3]

In recent times, researchers have redirected their focus towards investigating minor physical anomalies (MPA) and soft neurological signs (SNS) as potential indicators of neurodevelopmental abnormalities underlying schizophrenia.[4] Minor physical anomalies encompass subtle deviations from typical morphology, such as craniofacial asymmetries, limb irregularities, and dermatoglyphic variations.[3]

Soft neurological signs, conversely, denote non-specific neurological abnormalities identifiable through clinical assessments, including deficits in motor coordination, sensory perception alterations, and involuntary movements.[5] This shift in attention towards exploring the physical and neurological manifestations associated with schizophrenia reflects a growing recognition of the complex interplay between biological factors and psychiatric symptomatology.[5] By examining these subtle

markers, researchers aim to unravel the intricate pathways involved in the development and progression of schizophrenia, with the ultimate goal of informing more accurate diagnostic practices and tailored therapeutic interventions.

The relationship between MPA, SNS, and schizophrenia has sparked considerable debate within the scientific community. While some studies have reported elevated rates of MPA and SNS in individuals with schizophrenia compared to healthy controls, the significance of these findings and their implications for our understanding of the disorder remain uncertain.[6] Some researchers propose that MPA and SNS may represent early developmental markers of schizophrenia, reflecting underlying neurobiological abnormalities that predispose individuals to psychosis later in life. Alternatively, it has been suggested that MPA and SNS may emerge as a consequence of the neurobiological changes associated with schizophrenia or as side effects of antipsychotic medications, rather than serving as primary risk factors for the disorder.[7]

Against this backdrop, the present study seeks to address gaps in the existing literature by conducting a comprehensive investigation into the prevalence, characteristics, and clinical correlates of MPA and SNS in patients with schizophrenia. By comparing these physical and neurological markers between individuals with schizophrenia and the general population, we aim to elucidate their specificity to the disorder and their potential utility as biomarkers for diagnostic and prognostic purposes.[8] Additionally, we seek to explore the relationship between the severity of schizophrenia symptoms and the presence of MPA and SNS, as well as any associations between MPA and disease severity.

The present study was done to contribute to a deeper understanding of the complex interplay between neurodevelopmental anomalies, neurological dysfunction, and schizophrenia pathology. By elucidating the role of MPA and SNS in the etiology and clinical manifestation of schizophrenia, we hope to inform the development of more targeted diagnostic tools, personalized treatment approaches, and interventions aimed at improving outcomes for individuals affected by this debilitating disorder. Ultimately, our goal is to advance the field of schizophrenia research and enhance our ability to identify and address the diverse needs of patients living with this challenging condition.

MATERIALS AND METHODS

Study Setting: This study was conducted at the Department of Psychiatry OPD at Stanley Medical College and Hospital. The study period spanned from June 2019 to May 2020. The study took place within the hospital premises, utilizing its clinical facilities and resources. The study design employed was a cross-sectional comparative study, aiming to assess the prevalence and characteristics of minor physical anomalies (MPA) and soft neurological signs (SNS) in patients diagnosed with schizophrenia compared to controls.

Study Participants: Participants included individuals aged between 15 and 45 years, encompassing both males and females. Cases comprised individuals meeting the ICD 10 criteria for schizophrenia, including both first episode drug-naive patients and those currently receiving treatment. Controls were selected from individuals accompanying patients attending the medical OPD. Inclusion criteria encompassed willingness to participate and providing informed consent. Exclusion criteria comprised individuals with current or past medical or neurological illness, mental retardation, dementia, substance dependence, aggression, violent behavior, or unwillingness to participate.

Sample Size and Sampling Technique: The sample size consisted of 60 subjects, comprising equal numbers of cases and controls. The sampling technique involved consecutive sampling of eligible participants who met the inclusion and exclusion criteria.

Study Tools: Several instruments were utilized for data collection, including:

1. Socio-demographic Proforma: The Socio-demographic Proforma served as a comprehensive tool for collecting personal, medical, and family history information from study participants. It included sections covering demographic details such as age, gender, education, occupation, and marital status. Additionally, it captured personal and family medical history, including any past or current psychiatric diagnoses, neurological illnesses, or substance use disorders. The proforma also included a physical and mental status examination section to document any observable abnormalities or symptoms.
2. Waldrop Scale for Minor Physical Anomalies: The Waldrop Scale is a validated instrument used to assess minor physical anomalies (MPA) in individuals. It comprises a systematic evaluation of anatomical regions prone to MPA, including the eyes, ears, mouth, head, hands, and feet. The scale consists of 18 anomalous features distributed across these regions, with each anomaly assigned a weighted score ranging from 0 to 2 based on its severity. The total Waldrop score provides an indication of the number and severity of MPA present in a subject. A cutoff score of 3 was chosen to distinguish abnormal from normal populations, as determined by previous research studies.
3. Cambridge Neurological Inventory for Soft Neurological Signs: The Cambridge Neurological Inventory (CNI) is a standardized assessment tool designed to evaluate soft neurological signs (SNS) in individuals. It encompasses a checklist of subtle neurological

abnormalities across six categories: motor function, complex motor coordination, extra-ocular movements, other motor signs, primitive reflexes, and sensory integration. The inventory includes specific tasks and maneuvers to assess each category, such as gait assessment, coordination tests, and reflex examinations. The presence and severity of SNS are scored based on the performance of these tasks, providing valuable insights into subtle neurological dysfunction.

4. Positive and Negative Syndrome Scale (PANSS): The Positive and Negative Syndrome Scale (PANSS) is a widely used, standardized instrument for assessing psychopathology in schizophrenia. It consists of 30 items grouped into three subscales: positive symptoms, negative symptoms, and general psychopathology. Each item is rated on a 7-point scale, with higher scores indicating greater symptom severity. The PANSS is administered through a structured clinical interview and evaluates a range of symptoms, including hallucinations, delusions, affective flattening, and social withdrawal. It is considered a comprehensive tool for characterizing the symptom profile of schizophrenia and monitoring treatment response over time.
5. Mini International Neuropsychiatric Interview (M.I.N.I.): The Mini International Neuropsychiatric Interview (M.I.N.I.) is a structured diagnostic interview designed to screen for psychiatric disorders based on criteria outlined in the DSM-IV and ICD-10. It is a brief and reliable tool that can be administered in approximately fifteen minutes. The M.I.N.I. covers a wide range of psychiatric conditions, including mood disorders, anxiety disorders, psychotic disorders, and substance use disorders. It consists of a series of standardized questions aimed at eliciting symptoms indicative of various psychiatric diagnoses. The M.I.N.I. is particularly useful for clinical trials and epidemiological studies due to its efficiency and validity in identifying psychiatric disorders.

Study Methodology: Upon obtaining informed consent, participants underwent assessment using the aforementioned tools. The Socio-demographic Proforma collected personal, medical, and family history, along with physical and mental status examination details. The Waldrop Scale evaluated minor physical anomalies across six anatomical regions, assigning weightage to each anomaly. The Cambridge Neurological Inventory assessed soft neurological signs across various categories, including motor, sensory, and reflex functions. The PANSS was administered to assess psychopathology in schizophrenia, comprising positive, negative, and general psychopathology subscales. The M.I.N.I. was employed as a screening tool for psychiatric disorders.

Ethical Issues: Approval for the study was obtained from the institutional ethical committee. Informed consent was obtained from all participants prior to their inclusion in the study. Confidentiality and anonymity of participants' data were strictly maintained throughout the study.

Statistical Analysis: Data analysis was conducted using IBM SPSS software version 25. Descriptive statistics such as frequencies, percentages, means, and standard deviations were computed. Parametric and non-parametric analyses were employed appropriately based on the nature of the data collected. A P-value of less than 0.05 was considered to be statistically significant.

RESULT

Table 1 provides an overview of the sociodemographic characteristics of the study participants, comprising 60 cases and 60 controls. In terms of age distribution, most of cases and controls fall within the age range of 20-30 years, with 51.7% and 46.7%, respectively. Regarding gender, there is a slightly higher proportion of males among the cases compared to controls (56.7% vs. 48.3%). The socioeconomic status (SES) distribution reveals that a larger percentage of both cases and controls belong to the lower SES category (61.7% and 58.3%, respectively). Occupational status varies among the participants, with a notable portion being unemployed or engaged in unskilled or semiskilled occupations. Marital status shows a higher prevalence of married individuals among cases compared to controls (61.7% vs. 53.3%). Residence distribution indicates that a considerable proportion of both cases and controls reside in urban or semi-urban areas.

Table 1: Sociodemographic characteristics among the study participants

Characteristics	Cases (n=60)	Controls (n=60)
Age		
< 20 years	1 (1.7%)	2 (3.3%)
20-30 years	31 (51.7%)	28 (46.7%)
30-40 years	25 (41.7%)	23 (38.3%)
40-50 years	3 (5%)	7 (11.7%)
Gender		
Male	34 (56.7%)	29 (48.3%)
Female	26 (43.3%)	31 (51.7%)

Education		
Illiterate	2 (3.3%)	-
< 5th Std	25 (41.7%)	26 (43.3%)
6th - 8th Std	21 (35.0%)	24 (40.0%)
9th - 10th Std	8 (13.3%)	8 (13.3%)
11th - 12th Std	4 (6.7%)	2 (3.3%)
Socio-economic Status		
Lower SES	37 (61.7%)	35 (58.3%)
Upper Lower SES	21 (35.0%)	22 (36.7%)
Lower Middle SES	2 (3.3%)	2 (3.3%)
Upper Middle SES	-	1 (1.7%)
Occupation		
Unemployed	16 (26.7%)	13 (21.7%)
Unskilled	13 (21.7%)	17 (28.3%)
Semiskilled	17 (28.3%)	15 (25.0%)
Skilled	13 (21.7%)	14 (23.3%)
Clerical, Shop Owner, Farmer	1 (1.7%)	1 (1.7%)
Marital Status		
Unmarried	18 (30%)	15 (25%)
Married	37 (61.7%)	32 (53.3%)
Widow	2 (3.3%)	8 (13.3%)
Separated	3 (5%)	5 (8.3%)
Residence		
Urban	24 (40.0%)	26 (43.3%)
Semi-urban	24 (40.0%)	16 (26.7%)
Rural	12 (20.0%)	18 (30.0%)

In the case group (N=60), the mean age of onset of schizophrenia is 25.68 years. Among the cases, 17 individuals (28.3%) experienced their first episode of schizophrenia, while 43 individuals (71.7%) had already experienced their first episode. The mean duration of illness is 5.38 years, with a standard deviation of 5.19. Figure 9 displays the distribution of the duration of illness, indicating variability in illness duration among the cases.

Most cases did not report a family history of schizophrenia. Among them, 25% had second-degree relatives with schizophrenia, and 8% had first-degree relatives with schizophrenia. Figure 10 presents the distribution of family history of schizophrenia among the cases. Among the 60 cases, 85% experienced delusions falling within various severity categories, while 15% did not report delusions. About 75% experienced hallucinations falling within different severity categories, while 25% did not report hallucinations.

Table 2: Minor physical anomalies among the study participants

Anomaly			**Cases**	**Control**
Head	Fine Electric hair	Very Fine Hair	1 (1%)	0(0%)
		Soon Awry	3 (3%)	0(0%)
	Two or More Hair Whorls		2(2%)	1(4.7%)
	Head Circumference	>1.5 SD	3 (3%)	2(8.3%)
		>1.0<1.5 SD	5 (6%)	2(8.3%)
Eyes	Epicanthus	Deeply Covered	1 (1%)	0(0%)
		Partly Covered	3 (3%)	0(0%)
	Hypertelorism	>1.5 SD	4 (4%)	2(8.3%)
		>1.0<1.5 SD	7 (8%)	2(8.3%)
Ears	Low Seated Ears	Lower by>0.5 cm	2(2%)	2(8.3%)
		Lower by<0.5 cm	6(8%)	2(8.3%)
	Adherent ear lobule	Lower edge up and back towards the crown of head	4 (4%)	3(12.5%)
		Straight back to- ward rear of the neck	8(9%)	1(4.7%)
	Malformed ear		0(0%)	0(0%)

	Asymmetrical ear		2(2%)	0(0%)
	Soft and pliable ear		0(0%)	0(0%)
Mouth	High steepled palate	Steepled	10(11.4%)	2(8.3%)
		Flat and narrow at the top	7 (8%)	1(4.7%)
	Tongue	Furrowed tongue	3 (3%)	2(8.3%)
		Tongue with Rough and smooth spots	0(0%)	0(0%)

Table 2 presents the prevalence of minor physical anomalies (MPAs) among both cases and controls. In terms of anomalies related to the head, various features such as fine electric hair, soon awry hair, and two or more hair whorls show differences in occurrence between cases and controls. Regarding eye anomalies such as epicanthus and hypertelorism, differences in prevalence are noted between the two groups, with cases exhibiting higher frequencies. Ears anomalies, including low-seated ears and adherent ear lobule, also display variations in occurrence between cases and controls. Mouth anomalies, such as high steepled palate and tongue abnormalities, demonstrate differences in prevalence between cases and controls.

Table 3 illustrates the prevalence of soft neurological signs (SNS) among both cases and controls, highlighting differences in frequency between the two groups. In terms of motor signs, such as abnormalities in motor function, a significantly higher percentage of cases exhibit these signs compared to controls (28.3% vs. 1.7%, $p = 0.092$). Similarly, motor coordination deficits are more prevalent among cases than controls, with a significant difference noted (53.3% vs. 16.7%, $p = 0.000$). Examination of extraocular movements (EOM) also reveals a higher frequency of abnormalities among cases relative to controls (28.3% vs. 6.7%, $p = 0.010$). Other soft neurological signs, including primitive reflexes and sensory integration abnormalities, are more prevalent in cases compared to controls, with statistically significant differences observed ($p = 0.002$).

Table 3: Soft neurological signs among the study participants.

Sign	Frequency / Percentage	Case n=60	Control n=60	P-value
Motor	N	17	1	
	%	28.3	1.7	0.092
Motor coordination	N	32	10	
	%	53.3	16.7	0.000
EOM	N	17	4	
	%	28.3	6.7	0.010
Others	N	26	9	
	%	43.3	15	0.002
Primitive reflexes	N	13	0	
	%	21.7	0	0.002
Sensory integration	N	12	0	
	%	20	0	0.000

Correlation tests conducted between PANSS (Positive and Negative Syndrome Scale), and Soft Neurological Signs (SNS) reveal a positive relationship between them, as indicated by statistically significant p-values ($p < 0.05$). Specifically, a positive correlation is observed between SNS and individual symptoms such as delusion and hallucination ($p < 0.05$), indicating a potential association between soft neurological signs and specific symptoms of schizophrenia.

Analysis of the correlation between different variables among cases demonstrates no statistically significant relationship ($p < 0.05$). Correlation tests exploring the relationship between age of onset and Soft Neurological Signs reveal a negative correlation, although it is not statistically significant ($p = 0.481$). Similarly, the correlation between age of onset and Minor Physical Anomalies also demonstrates a negative association without statistical significance ($p = 0.622$), respectively

DISCUSSION

Schizophrenia, a complex and debilitating psychiatric disorder, poses significant challenges in both diagnosis and treatment. Understanding the underlying etiology and associated factors is crucial for effective management and improved outcomes. The present study aimed to explore various socio-demographic, clinical, and neurological characteristics among individuals with schizophrenia, shedding light on potential avenues for further research and clinical intervention.

The socio-demographic profile of individuals with schizophrenia is multifaceted and plays a crucial role in shaping the course and outcome of the disorder. In our study, we observed that a substantial proportion of both cases and controls fell within the age range of

20-30 years, consistent with findings from previous research highlighting the peak onset of schizophrenia during early adulthood (Choi et al., 2012[9]). Additionally, we noted a higher prevalence of males among cases compared to controls, aligning with existing literature suggesting a slightly higher incidence of schizophrenia in males (McGrath et al., 2004[10]).

Regarding socioeconomic status (SES), a notable finding was the predominance of individuals from lower SES backgrounds among both cases and controls. This observation is consistent with previous studies highlighting the association between lower SES and increased risk of schizophrenia (Selten et al., 2013[11]). The higher prevalence of individuals engaged in unskilled or semiskilled occupations among both groups underscores the impact of socio-economic factors on the manifestation and trajectory of schizophrenia.

The clinical presentation of schizophrenia encompasses a spectrum of symptoms and features, including positive and negative symptoms, cognitive deficits, and neurobiological abnormalities. In our study, we observed a mean age of onset of 25.68 years among individuals with schizophrenia, which aligns with existing literature documenting the typical onset of the disorder during early adulthood[12]. (American Psychiatric Association, 2013).

Notably, a substantial proportion of cases reported experiencing delusions (85%) and hallucinations (75%), consistent with the hallmark symptoms of schizophrenia outlined in diagnostic criteria[12]. These findings underscore the clinical heterogeneity of schizophrenia and highlight the prevalence of psychotic symptoms in affected individuals.

The presence of minor physical anomalies (MPAs) and soft neurological signs (SNS) among individuals with schizophrenia has garnered interest as potential markers of underlying neurodevelopmental abnormalities. In our study, we observed variations in the prevalence of MPAs and SNS between cases and controls, with a higher frequency noted among individuals with schizophrenia.

Specifically, anomalies related to the head, eyes, ears, and mouth demonstrated differences in prevalence between cases and controls, suggesting potential neurodevelopmental disruptions in affected individuals[13]. Moreover, motor coordination deficits, abnormalities in extraocular movements, primitive reflexes, and sensory integration abnormalities were more prevalent among cases compared to controls, indicating underlying neurological dysfunction in schizophrenia.

Correlation analysis between PANSS scores and SNS revealed a positive relationship, with statistically significant p-values, indicating a potential association between soft neurological signs and symptom severity in schizophrenia. These findings support existing literature suggesting a link between neurocognitive impairments and symptomatology in schizophrenia (Khalil et al., 2020[14]). However, correlation tests exploring the relationship between different variables among cases did not yield statistically significant results, highlighting the complex and multifactorial nature of schizophrenia. Additionally, correlations between age of onset and SNS, as well as MPAs, did not reach statistical significance, suggesting that these variables may not directly influence the onset or course of schizophrenia in our sample.

The findings of our study have several implications for clinical practice and research in schizophrenia. Firstly, the socio-demographic and clinical characteristics observed underscore the need for tailored interventions targeting vulnerable populations, particularly those from lower SES backgrounds. Secondly, the association between SNS and symptom severity highlights the potential utility of neurological assessment in predicting disease progression and treatment response.

Future research endeavors should focus on elucidating the neurobiological underpinnings of schizophrenia, exploring the role of genetic, environmental, and neurodevelopmental factors in disease pathogenesis. Additionally, longitudinal studies examining the trajectory of neurological abnormalities and their impact on clinical outcomes are warranted to inform early intervention strategies and personalized treatment approaches in schizophrenia.

Despite its contributions, this study has several limitations. Firstly, the cross-sectional design precludes causal inferences, necessitating longitudinal investigations to elucidate temporal relationships. Secondly, the reliance on self-report measures may introduce recall bias, affecting the accuracy of data. Additionally, the small sample size limits generalizability, warranting replication in larger cohorts. Moreover, the exclusion of certain demographic groups may limit the study's representativeness. Lastly, the absence of neuroimaging data precludes comprehensive evaluation of neurological abnormalities.

CONCLUSION

This study sheds light on the sociodemographic characteristics, minor physical anomalies, and soft neurological signs among individuals with schizophrenia. The findings highlight the importance of comprehensive assessments in clinical practice and research, facilitating early detection and intervention. Despite certain limitations, this study contributes to our understanding of the complex interplay between sociodemographic factors and neurological abnormalities in schizophrenia.

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