

## Cognitive functioning and functional ability in women with schizophrenia and homelessness

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### ABSTRACT

**Background:** Studies of schizophrenia and homelessness are minimal from the Indian subcontinent. Women with schizophrenia and homelessness in India remain a highly vulnerable group and there is no data to date regarding their clinical characteristics. Cognitive impairment in schizophrenia remains a major factor determining outcomes in schizophrenia. We examined the cognitive functioning of women with schizophrenia and homelessness (WSH) and compared it to an age-matched group of women with schizophrenia living with their family (WSF). **Methods:** 36 women with schizophrenia and homelessness, and 32 women with schizophrenia who were living with family were evaluated for psychopathology using Scale for Assessment of Positive Symptoms (SAPS)/ Scale for assessment of negative symptoms (SANS) scales. Cognitive function was assessed using Montreal Cognitive Assessment (MOCA)/Rowland Universal Dementia Scale (RUDAS), and Frontal Assessment Battery (FAB), disability using World Health Organization - Disability assessment Scale (WHO-DAS) and psychosocial factors using a semi-structured proforma. The groups were compared using *t*-tests and chi-square for continuous and categorical variables respectively.

**Results:** Women with schizophrenia and homelessness were found to have significantly lower cognitive functioning, and much higher disability. Cognition and disability for women with schizophrenia and homelessness differed by 2–3 standard deviations with the mean for women living with family (i.e. *z* scores). Women with schizophrenia experiencing homelessness (WSH group) exhibited higher literacy levels and previous work experience compared to their counterparts. Those with family support are likely to face reduced pressures to work or earn, which further suggests that premorbid levels of functioning may not be the primary factors influencing the differences observed in cognitive assessments.

**Conclusions:** The study demonstrates significantly higher cognitive dysfunction in women with homelessness and schizophrenia, raising the possibility of much higher cognitive dysfunction being a predictor for homelessness in Indian women with schizophrenia.

### 1. Introduction

Schizophrenia is a major psychiatric disorder known to impact multiple domains of an individual's life and lead to poor outcomes including homelessness and disability (Priebe, 2007; Davidson and McGlashan, 1997; Jauhar et al., 2022). Homelessness and schizophrenia are thought to have a bi-directional relationship (Smart et al., 2021). Individuals with schizophrenia experiencing homelessness are known to have more severe psychopathology, probably owing to poor treatment

adherence (Tripathi et al., 2013; Opler et al., 2001). In male patients, higher severity of positive symptoms and to a lesser extent substance abuse and medication non-adherence is associated with homelessness (Opler et al., 2001; Opler et al., 1994).

India has widely different mental health service delivery across its states. The government supported national programs, National Mental Health Program (NMHP) and District Mental Health Program (DMHP) primarily addresses the acute treatment gap (Gupta and Sagar, 2018). Metropolitan cities have the greatest number of psychiatrists and mental

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health establishments. There is hardly any community mental health service to support patients once discharged from acute care, and family still takes up the entire burden of care in this society. In higher-income countries, community mental health services often provide substantial support. Increasing urban migration, nuclear family system in the cities, loss of traditional community systems in rural areas, rising costs of living without commensurate increase in income, and lack of adequate social support like disability pension, unemployment benefits and social housing options are leading to a gradual but steady decline in care for the serious mentally ill in India (Ul Hassan et al., 2019; Gowda et al., 2019).

Studies on schizophrenia with coexisting homelessness in higher income countries are often confounded by the high rates of substance use in the patient population. However, women with schizophrenia in low and middle-income countries, including India, experience distinct challenges. Despite generally having better schizophrenia outcomes, they are more prone for poor family support and homelessness, likely due to gender and social disparities affecting access to healthcare and resources (Thara and Kamath, 2015; Zodpey and Negandhi, 2020; Moradhvaj and Saikia, 2019). Interestingly, this population in India has very low rates of substance use (Sadath et al., 2022). Despite this opportunity, research on women with schizophrenia and homelessness in India is sparse, with little data on illness severity, treatment response, cognitive deficits, and functional impairment (Thara and Kamath, 2015; Rao, 2004). This raises the question as to why women with schizophrenia and homelessness experience more severe decline in their psychosocial functioning, in spite they, as a group in India are generally known to have better outcomes in schizophrenia. The inherent vulnerability of these women patients in a social setting with minimal community-based care is compounded by the fact that they are most often not linked with government services, whether medical care or psycho-social supports like disability pension.

Among the various factors that determine outcome in Schizophrenia, the most important appears to be cognitive impairment (Rao, 2004). Cognitive symptoms in Schizophrenia have long been recognized to be an independent domain of the disorder, and is well known to respond poorly to medications, and remains the major barrier to social reintegration of the patients with severe form of the disorder (Kuperberg and Heckers, 2000; Kahn and Keefe, 2013). It is evident from many studies from higher income countries that a focused intervention on functional abilities, skills, social cognition, working memory, mentalization and emotion recognition may be important at the earliest to change outcomes (Hajdúk et al., 2021). However, there is limited information on the clinical characteristics of homeless women with schizophrenia in India, particularly concerning cognitive functioning.

Understanding the profile and characteristics of homeless women with schizophrenia is critical for identifying major risk factors and designing targeted interventions. Identifying severe cognitive impairments in this population may facilitate earlier detection of individuals at risk for poor outcomes and guide the development of more intensive interventions. This study, therefore, aims to assess cognitive impairment among women with schizophrenia who are homeless and those living with family support, comparing their cognitive functioning, illness severity, and disability levels.

The objectives of the study are:

1. To evaluate the cognitive functioning of female patients with schizophrenia who are homeless and those who live with family support.
2. To understand the differences in cognitive function between the groups.

To understand the differences in illness severity and disability between the groups.

## 2. Methods

### 2.1. Study design

This is as a cross-sectional observational study of a group of female patients diagnosed with schizophrenia and who are homeless, assessing their cognitive function, symptom severity and disability. The group for comparison, those living with family, were selected from the tertiary hospital's psychiatry out-patient clinic (SRIHER, Chennai). Principles of observational studies as per STROBE guidelines were used to decide on the design and description of data. The study was approved by the Institutional Ethics Committee, Sri Ramachandra Institute of Higher Education and Research (SRIHER), Chennai (Ref:IEC/NI/20/OCT/76/99).

### 2.2. Participants and settings

The study included two distinct groups of female patients diagnosed with schizophrenia, recruited from January 2020 to June 2022. For ease of understanding, we labelled the group as Women with Schizophrenia and homelessness (WSH) and Women with Schizophrenia with Family (WSF).

This study included women aged 18–60 years with a DSM-5 diagnosis of schizophrenia. Participants had to be clinically stable for at least six months, and able to give informed consent (or have a legally authorized representative provide it if needed). Patients with intellectual or developmental disabilities, severe physical illnesses that could affect cognitive testing (such as stroke or brain injury) were not included. Participants were also excluded if they had recent substance dependence (in the last six months), were pregnant or breastfeeding, or had received electroconvulsive therapy (ECT) in the past year.

WSH included in the study were all admitted to the inpatient unit of the Non-Government Organization home (NGO named Anbagam-TERDOD) from the streets, following formal admission procedures with police support. The emergency assistance and care were done as part of the Mental Health Care Act 2017 and the Tamil Nadu State Government's Emergency Care and Recovery Centre model of care principles (Malhotra, 2023; About TAEI, n.d.). After three months of acute inpatient treatment, the WSH participants were transferred to the rehabilitative pathway within the NGO. The socio-demographic variables were collected using a semi-structured questionnaire, and further details were also obtained from the patient records. The WSH patients selected hence had completed acute phase of the treatment and were continuing their rehabilitation in the NGO with no family traced for reintegration.

The patients were evaluated by a senior consultant psychiatrist (JM), and had a diagnosis of schizophrenia confirmed through at least 6 months of observation, patient account and collateral information wherever available. All had completed antipsychotic treatment for at least 6 months as per the established treatment guidelines. Participants had no access to substances during the study period, which was reinforced by strict supervision throughout the observation process. The patients included were predominantly Tamil speaking and a few were Hindi speaking. The investigators were fluent in both these languages as well as English.

Women with Schizophrenia living with family (WSF) was representative of the population in the western parts of the city, and mostly encompassed patients from lower- and middle-income families. In the city, most of the patients sought outpatient consultations in the clinics associated with major hospitals. There are hardly any community mental health services providing outpatient clinic consultation. Convenience sampling was used, and consecutive patients were selected after review by the consultant psychiatrist, once they fulfilled the inclusion criteria. The absence of substance use was confirmed through regular clinical evaluations and corroborated by family members. Senior consultant psychiatrist (SJK) confirmed the diagnosis through detailed

interviews and verification of clinical records.

### 2.3. Variables

The following were the variables of interest: 1) psychosis severity as assessed by Scale for Assessment of Positive Symptoms (SAPS) and Scale for Assessment of Negative Symptoms (SANS). SAPS/SANS is a well validated scale used universally for evaluation of psychopathology in schizophrenia and related disorders (Andreasen, 1989); 2) Cognitive function assessed by Montreal Cognitive Assessment (MOCA) for literate patients/Rowland Universal Dementia Assessment Scale (RUDAS) for illiterate patients and Frontal Assessment Battery (FAB) (Nasreddine et al., 2005; Storey et al., 2004; Hurtado-Pomares et al., 2018). MOCA has validated versions in Tamil and Hindi and hence it was used for assessment of the patients. RUDAS is a language and culture independent scale for screening of cognitive functions and can be administered in various clinical settings. Both scales have been previously used in patients with schizophrenia and noted to be useful in assessing cognitive function in long standing psychosis (Gil-Berrozpe et al., 2020). In this study, more women in the WSH group were literate, allowing for a higher utilization of MOCA. Conversely, the WSF group included women with varying literacy levels, necessitating the use of RUDAS for those who were illiterate. By employing both tools, the study focused on comparing overall cognitive function rather than the subcomponents, which allowed for a more holistic understanding of cognitive capabilities across different literacy levels. This approach maximized the inclusivity of the study and enhanced the validity of the findings by using the most suitable tool for each group's literacy capabilities while maintaining the focus on overall cognitive function. 3) Disability due to the illness was assessed by WHO-DAS (Konecky et al., 2014; Basavarajappa et al., 2016).

### 2.4. Data sources/measurement

For the WSH group, living in the long stay home of the NGO, senior consultant psychiatrist (JM) evaluated the patients using PANSS interview schedule and subsequently scored the SAPS/SANS. A trained mental health nurse fluent in the language and with expertise in administering screening tools for cognition and disability completed the assessments with MOCA, FAB and WHO-DAS. Randomly, some of the patients were independently assessed by the senior consultant psychiatrist (JM) in order to ensure consistency in assessment and scoring of scales.

WSF group were evaluated by a trained clinical psychologist, who conducted the structured clinical interview using PANSS interview schedule, and additional questions were added to cover the entire SAPS/SANS scoring. The disability assessment was performed in collaboration with a family member. The cognitive assessments were performed on a follow-up visit (within 2 weeks).

### 2.5. Bias

The clinicians who interviewed each group of patients remained blind to the assessment of other group during the entire duration of the study. Even though selection bias was unavoidable, consecutive sampling of patients who fulfilled intake criteria helped in mitigating this.

### 2.6. Study size

Despite the limited numbers of patients presenting with homelessness and unwell status in the NGO directly, or through transfer, effort was taken to include as many patients as possible. There were no previous studies from India which looked at these variables in detail and hence a sample size was not arrived at a-priori. For statistical evaluation using *t*-tests, 25 is considered as the minimum number of participants. We were able to complete evaluation of 36 subjects during the study

period.

### 2.7. Statistical methods

IBM SPSS (Statistical Package for Social Sciences) Version 27 was used to do statistical analysis. The sociodemographic, treatment, illness, cognitive scores, and disability scores were presented in frequencies and mean  $\pm$  standard deviation. The significance of the association between continuous variables was assessed using the independent sample *t*-test. *P* value of  $<0.05$  was taken as a statistically significant difference between the two groups.

## 3. Results

### 3.1. Participants

A total of 60 consecutive women with schizophrenia living with family (WSF) were screened for eligibility, 36 women were found eligible and 32 consented to the study. Of the 60 women with schizophrenia and homelessness (WSH) who were screened for eligibility, 45 women were found to be eligible and 36 were recruited to the study following informed consent. 10 patients who lacked capacity to give consent, nominated representative (as per the Mental Health Act, 2017) gave permission for the assessment, once they were found eligible to participate. Reasons for ineligibility included not meeting the age criteria, less than six months of supervised or regular treatment, and pregnancy or breastfeeding. The age and illness duration of those who

**Table 1**  
Shows the sociodemographic and treatment characteristics of the sample.

| SD variable   | Women with schizophrenia living with family support (WSF group)<br>N = 32 | Women with schizophrenia and homelessness (WSH group)<br>N = 36 |
|---|---|---|
| Age (years) [Mean $\pm$ SD]                                 | 44.19 $\pm$ 9.58  | 41.39 $\pm$ 7.90  |
| Education [n%]  |   |   |
| Illiterate  | 2(6 %)  | 7(19 %)   |
| Primary school  | 9(28 %)   | 2(5.6 %)  |
| Middle school   | 4(12 %)   | 7(19 %)   |
| High school   | 12(38 %)  | 13(36 %)  |
| Graduate  | 5(16 %)   | 7(19 %)   |
| Employed ever [n%]  |   |   |
| Yes   | 5(16 %)   | 17(47 %)  |
| No  | 27(84 %)  | 19(53 %)  |
| Marital status [n%]   |   |   |
| Unmarried   | 2(6 %)  | 14(39 %)  |
| Married   | 19(59 %)  | 3(8 %)  |
| Separated/divorced  | 3(9.4 %)  | 18(50 %)  |
| Widowed   | 8(25 %)   | 1(3 %)  |
| Antipsychotic dose [Mean $\pm$ SD] [CPZ equivalent dose]    | 286.72 $\pm$ 116.05   | 325.14 $\pm$ 172.75   |
| Anticholinergic dose [Mean $\pm$ SD] [Trihexyphenidyl dose] | 2.25 $\pm$ 0.71   | 2.22 $\pm$ 0.65   |
| Mood stabilizer use [n %]                                   |   |   |
| Yes   | 2(6 %)  | 4(14 %)   |
| No  | 30(94 %)  | 31(86 %)  |
| Antidepressant use [n %]                                    |   |   |
| Yes   | 3(9 %)  | 16(44 %)  |
| No  | 29(91 %)  | 20(57 %)  |
| Benzodiazepine use [n %]                                    |   |   |
| Yes   | 5(16 %)   | 3(8 %)  |
| No  | 27(84 %)  | 33(92 %)  |
| Current substance use disorder [n%]                         | 0 %   | 0 %   |

were recruited and those not recruited were not significantly different (Table 1).

### 3.2. Descriptive data

The study sample included 68 women with schizophrenia, 32 living with family support (WSF), and 36 with homelessness (WSH, living in long-stay shelters). The mean age of the women living with family (WSF) and those with homelessness (WSH) was 44.5 years (SD 9.5) and 41.39 years (SD 7.9) respectively.

The mean age of the sample was 41.39±7.90 years. The age and education profile of both groups were not significantly different (Table 1). Women with schizophrenia and homelessness (WSH group) had higher rates of lifetime employment compared to women living with family support (WSF group). Greater proportion of women living with the family were married compared to women with homelessness. The mean antipsychotic dose (chlorpromazine equivalents) among women in with schizophrenia and homelessness (WSH group) was significantly higher than those with SZ living with family support (WSF group). 10 out of 36 patients in the long-stay home were on clozapine, and even in them the response has been less than ideal, with only 20 % (2 out of 10) showing good clinical and functional improvement on clozapine.

In terms of psychosis severity, women with schizophrenia and homelessness (WSH group) had significantly higher total SAPS scores (Mean±SD = 29.92±19.89) than the women living with family support (Mean±SD = 3.66±11.19, t value 6.56, df 66, Cohen's d effect-size -1.60, z-score -5.72) (Table 2). They also had significantly higher total SANS scores (Mean±SD = 46.11±26.92) compared to women living with family support (Mean±SD = 6.66±11.43, t value 7.69, df 66, Cohen's d effect-size -1.87, z-score -6.39) (Table 2).

On cognitive performance, women with schizophrenia and homelessness (WSH group) had significantly lower total MOCA scores. (Mean ±SD = 16.79±7.01) than the women living with family support (Mean ±SD = 23.32±3.39, t value -4.92, df 45, Cohen's d effect-size 1.18, z-score 3.50) (Table 2). They also had significantly lower total RUDAS scores (Mean±SD = 17.88±4.76) than the women living with family support (Mean±SD = 24.31±3.33, t value -3.65, df 19, Cohen's d effect-

size 1.64, z-score 3.14), and significantly lower FAB total score (Mean ±SD = 9.64±4.52) than the women living with family support (Mean ±SD = 15.38±1.56, t value -6.83, df 66, Cohen's d effect-size 1.66, z-score 5.87) (Table 2). Overall, in both group of women, cognitive screening scores did show some correlation with disability, but did not reach statistical significance.

In terms of global level of functioning, women with schizophrenia and homelessness (WSH group) had significantly higher WHODAS disability percent scores (Mean±SD = 55.57±12.2) than the women living with family support (Mean±SD = 23.45±9.37, t value -12.06, df 66, Cohen's d effect-size -2.93, z-score -8.32) (Table 2). The mean domain scores of WHODAS and the mean total disability percent score are higher in women with schizophrenia and homelessness (WSH group) than those of women living with their families and the difference was statistically significant (Fig. 2).

The primary result of the study shows significantly greater severity of psychopathology (Fig. 1), cognitive impairment, and extent of disability (Fig. 2) among women with schizophrenia and homelessness (WSH group). Notably, women with schizophrenia and homelessness (WSH group) had higher rates of lifetime employment compared to women living with family support, suggesting that these differences cannot be explained by premorbid level of functioning. None of the patients had an active substance use disorder. The findings were hence not confounded by comorbid substance use. The control sample in this study was of comparable socio-economic background. The hospital population were from the general psychiatry outpatient clinic which caters to the low and lower-middle socio-economic section of the society. All women with schizophrenia and homelessness (WSH group) belonged to lower socio-economic status. There was no difference in age or educational level of the patient groups. One major demographic difference between the groups was in marital status. Greater proportion of women with schizophrenia and homelessness (WSH group) were never married/separated or divorced from their husbands, which reflects the poorer socio-occupational outcomes of women with psychosis across the world (Smart et al., 2021; Smartt et al., 2019).

### 4. Discussion

To the best of our knowledge, this is the first study from India to examine cognitive functioning of women with schizophrenia and homelessness (WSH group), other clinical factors and disability and compared to a similar age and gender matched group who have family supports. The study found that women with schizophrenia and homelessness (WSH group), have more severe illness (>3 standard deviations from the mean of control group measured by SANS, SAPS), greater cognitive deficits (>2-3 standard deviations from the mean of control group) and greater disability (>3 standard deviations from the mean of control group). They were also on higher doses of antipsychotic medications (CPZ equivalents). The large degree of deviation (>3 standard deviations) from the control group suggests that women with schizophrenia and homelessness (WSH group) may represent an extreme phenotype of the illness. These findings were not confounded by comorbid substance use, unlike studies from the western countries (Gupta and Sagar, 2018).

While schizophrenia and homelessness are considered to have a bidirectional relationship (Opler et al., 2001), not all patients with schizophrenia experience homelessness. Cognitive impairment has been shown to be an important domain in schizophrenia which impacts outcome (Reichenberg et al., 2019; Heinrichs and Zakzanis, 1998; Oomen et al., 2023). Study comparing sheltered and unsheltered homeless veterans in U.S. have shown that overall cognition, visual learning and social cognition were the important factors that associated with longer stay in unsheltered locations (Llerena et al., 2018). Homelessness could be the outcome of this severe impairment in cognition, which incapacitates the patients in this group, leading to decline in socio-occupational functioning.

**Table 2**  
Illness, cognition and disability score details of the study participants.

|                                  | Women with schizophrenia living with family support (WSF) | Women with schizophrenia and homelessness (WSH) | p-Value | Effect size (Cohens d) 95 % CI s | Z score |
|----------------------------------|---|---|---------|----------------------------------|---------|
| SAPS total score [Mean ± SD]     | 3.66±11.19<br>N = 32                                      | 29.92±19.89<br>N = 36                           | <0.001* | -1.60<br>[-2.15 to -1.05]        | -5.72   |
| SANS total score [Mean ± SD]     | 6.66±11.43<br>N = 32                                      | 46.11±26.92<br>N = 36                           | <0.001* | -1.87<br>[-2.44 to -1.29]        | -6.39   |
| MOCA total score [Mean ± SD]     | 23.32±3.39<br>N = 19                                      | 16.79±7.01<br>N = 28                            | <0.001* | 1.18<br>[0.49 to 1.74]           | 3.50    |
| RUDAS total score [Mean ± SD]    | 24.31±3.33<br>N = 13                                      | 17.88±4.76<br>N = 8                             | 0.002*  | 1.64<br>[0.62 to 2.66]           | 3.14    |
| FAB total score [Mean ± SD]      | 15.38±1.56<br>N = 32                                      | 9.64±4.52<br>N = 36                             | <0.001* | 1.66<br>[1.10 to 2.21]           | 5.87    |
| WHODAS percent score [Mean ± SD] | 23.45±9.37<br>N = 32                                      | 55.57±12.2<br>N = 36                            | <0.001* | -2.93<br>[-3.62 to -2.24]        | -8.32   |

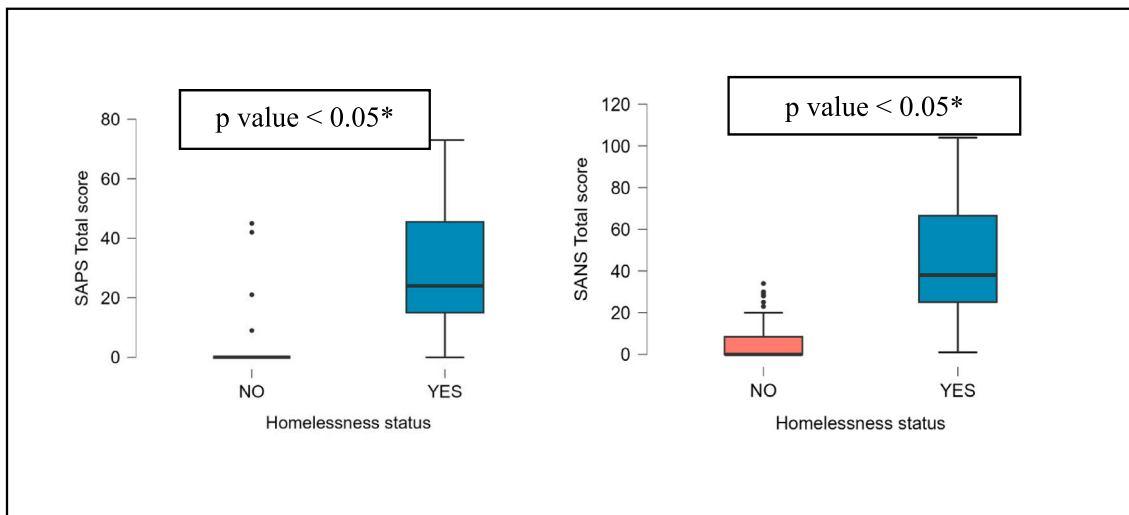


Fig. 1. SAPS and SANS total scores by homelessness status.

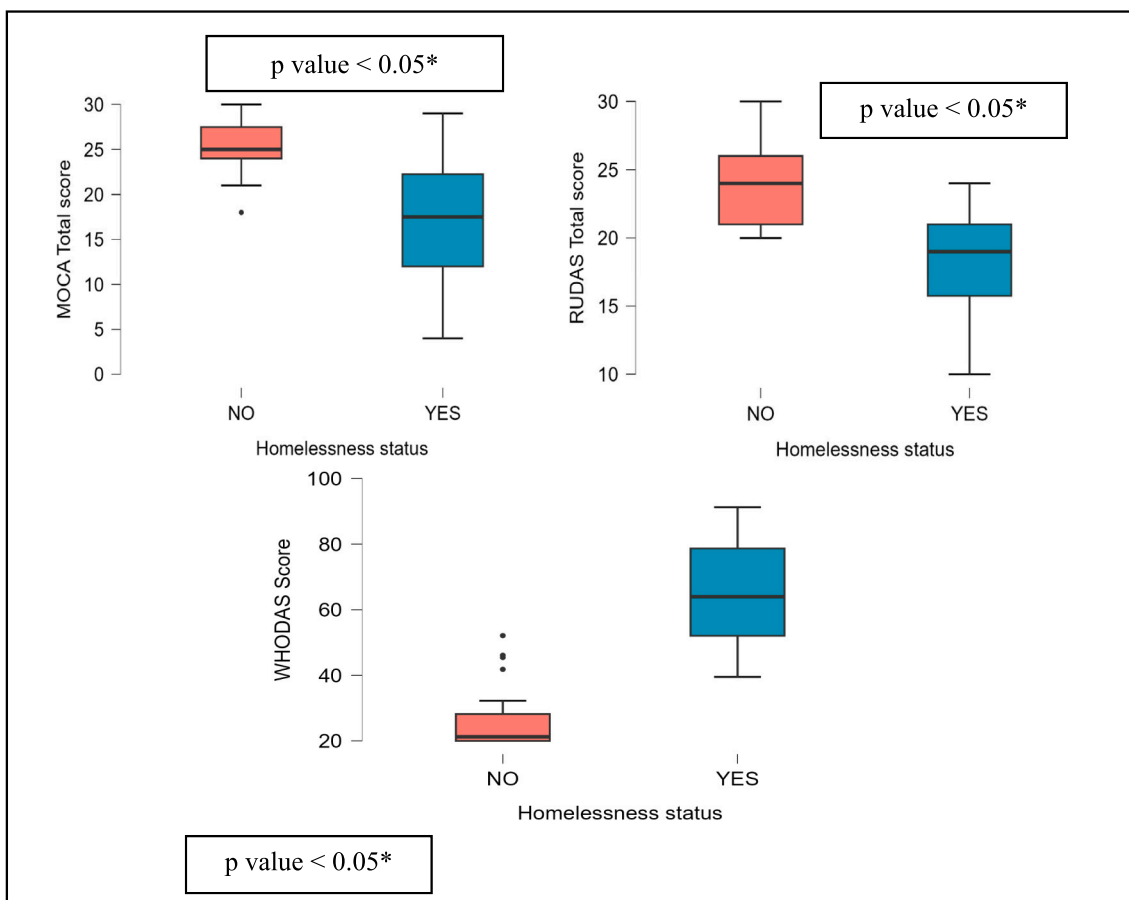


Fig. 2. Cognitive scores and disability scores by homelessness status.

Our study shows that patients with homelessness have much severe cognitive impairment compared to those living with family, and the difference between the groups were of large effect size. The degree of impairment was to such an extent that patients were unable to participate in detailed cognitive testing using specific cognitive assessment tools used in schizophrenia. Most of the patients in the homeless group could not understand even simple instructions in the Tamil version of the Brief Assessment of Cognition in Schizophrenia (BACS) or NIMHANS

battery, two commonly used cognitive assessment tools in schizophrenia in India. Frontal/executive functions were especially affected as evidenced by the scores both in MOCA and FAB. This is consistent with previous studies on the prevalence and effects of frontal dysfunction in schizophrenia (Minzenberg et al., 2009; Weickert et al., 2000; Reichenberg, 2010; Yamashita et al., 2022). There was difficulty in carrying out cognitive assessment in the (WSH) homeless group, possibly owing to the extent of psychopathology and severity of cognitive



difficulties in that group. Following extensive discussions with neuropsychologists from National Institute of Mental Health and Neurosciences (NIMHANS) and Schizophrenia Research Foundation (SCARF), who had vast experience in research in patients with schizophrenia, cognitive screening tools MOCA and RUDAS were considered, as they had good construct validity and inter-rater reliability, and validated local language versions were available.

Impairment in cognitive functions was not unexpected, but the extent, severity and the significant difference between the group with a large effect size (1.64–1.66) supported the notion that this population may represent an extreme phenotype of the illness. This is also reminiscent of the concept of hebephrenic schizophrenia (described by Kahlbaum and Ewald Heckers) with unique clinical picture characterized by severe and persistent cognitive impairment, that remains non-responsive to antipsychotic medications (Maggini and Dalle, 2022; Medeiros et al., 2021). The clinical outcome remains poor in this subtype (Fenton and McGlashan, 1991) and has historically been thought to result in homelessness. It remains to be seen if these patients fare better with treatment initiation earlier in the course of the illness or with newer non-dopamine based medications.

The significant impairment in socio-occupational dysfunction in patients with homelessness is another matter that require further evaluation. A combination of social worker led adherence enhancement strategies with long-acting injectable antipsychotics appear to improve outcomes in African-American youth with substance and severe mental illness (Sajatovic et al., 2017). However in our study, all the patients were under supervised medication and inpatient rehabilitation. The NGO home has a highly structured psycho-social intervention program which includes group therapy, life skills training, occupational therapy, vocational training, horticulture and gardening, relaxation and games, social and cultural activities, which is far more than what an average individual with schizophrenia receives in the community as part of non-pharmacological treatment. Many patients in this category remain heavily dependent on the supportive residential facility. The majority are categorised as those with high dependency and poor capacity, and unable to live independently or earn. The persistence of severe disability in spite of rigorous supervised pharmacotherapy and non-pharmacological interventions points to the need for much earlier cognitive remediation therapy in those patients who shows considerable cognitive impairment during the first episode of the illness itself, which could help change the outcome.

The study also brings to focus the need for a clear plan of action for rehabilitation of these patients like in high-income countries (Montgomery et al., 2013). The new Mental Health Care Act 2017 in India puts the onus of providing adequate community based housing onto the government (Mental Health Care Act, 2017). These are the patients who stay in government run hospitals (asylums of the bygone era) and who are incapable of living independently in the community. Studies have looked at various interventions for addressing homelessness in serious mentally ill population and its outcomes in different countries (Gowda et al., 2017; Kerman et al., 2019; Rosenheck, 2000). Safe and secure social housing projects fully funded by the government (Folsom et al., 2005; Stergiopoulos et al., 2019) is the urgent need of the hour to ensure wellbeing of this population. In a country like India which aspires to rapidly progress in many social indices, supported housing for the serious mentally ill who are homeless need to be prioritised as the burden of care is huge in absolute numbers. This will go a long way in ensuring better outcomes in this most under-served patient population (Smartt et al., 2019; Bighelli et al., 2021), who tragically appears to have the most severe form of the illness.

#### 4.1. Limitations

Our study being observational, has its limitations in drawing conclusions regarding factors associated with homelessness. The sampling of patients was determined by their presence in the NGO and ability to

provide informed consent. We have used only screening tools for assessing cognition rather than cognitive batteries due to practical difficulties. Additionally, the scores on symptom severity among women with schizophrenia living with their family (WSF group) were low, but comparable to that reported in other studies from the area (Malla et al., 2020; Lemonde et al., 2023). The fact that the sample comprised exclusively of women and were earlier in the course of illness may account for lower scores. It is also possible that women under-report symptoms because of stigma and social pressure to present as being well.

Another limitation is that some of the homeless patients provided no details regarding their age of onset of illness, duration of untreated psychosis (DUP) and could not give an accurate treatment history. This limited making conclusions regarding non-response to psychotropic medications, even though supervised treatment for at least 6 months was ensured. Future research could benefit from examining duration of psychiatric service involvement in greater detail to better understand its influence on the outcomes of interest.

## 5. Conclusions

The study shows that women with schizophrenia and homelessness (WSH group) had greater cognitive impairment, more severe psychopathology and disability. The study raises many questions which need to be answered through long term follow up studies. Is there a causal association between cognitive dysfunction and associated disability with homelessness in India? Is homelessness a cause or an effect of decline in functional ability? Are we looking at an extreme phenotype of schizophrenia with its unique treatment resistant features? If homelessness as an outcome needs to be prevented, what would the most reliable intervention at the beginning of the illness in this group? Newer drugs that act on non-dopamine pathways, early identification, unique biomarker that predicts the type of illness and prognosis, and earlier initiation of cognitive remediation therapy (CRT) may be some of the most important requisites to reduce the burden of illness in this group of severely unwell patients. The challenges of implementing this in a resource limited country like India are huge. Finally, the study also highlights the importance of incorporating ethnic and population diversity in schizophrenia research (Burkhard et al., 2021).

### CRedit authorship contribution statement

**Jayakumar Menon:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Suvarna Jyothi Kantipudi:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Aruna Mani:** Writing – review & editing, Project administration, Data curation. **Rajiv Radhakrishnan:** Writing – review & editing, Supervision, Conceptualization.

### Declaration of competing interest

Rajiv Radhakrishnan is funded by VA National Center on Homelessness Among Veterans (RFQ36C24820Q1276), National Institute of Mental Health (NIMH) (R21MH123870) National Institute of Drug Abuse (NIDA), National Center for Complementary and Integrative Health (NCCIH) and has received research support from GW Pharmaceuticals (Jazz Pharmaceuticals) and Neurocrine Biosciences. The views expressed are those of the authors and not of those of the federal government or funding agencies.

Jayakumar Menon has worked as sub-investigator in a multi-national drug trial by Pfizer.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.scog.2024.100338>.

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