ABSTRACT

Background: Schizophrenia is associated with excess mortality experience than the general population. Though this is one of the important outcome measures, it has not been adequately explored especially in rural community dwelling patients in India. We describe the standardized mortality ratio (SMR) of a cohort of schizophrenia patients of Thirthahalli, one such rural taluk of South India. Materials and Methods: SMRs for the years 2009-2011 were calculated. A number of patients in the cohort were 301, 317, and 325 for those consecutive years, respectively. Observed deaths among the patients were noted for these years separately. Crude death rates (CDRs) of the general population of Shimoga district were obtained from the Statistics Department of the Government of Karnataka. CDR (per 1000) was multiplied by the number of patients in each year to get the expected deaths. Then, observed deaths were divided by the expected deaths to get the SMR. Results: There were totally 12 deaths among the patients in these 3 years. SMRs for the years 2009, 2010, and 2011 were respectively 1.4, 1.8, and 2.2. Six had died out of natural (medical) causes. Four had committed suicide, and one died from an accident. Cause from one death remained unknown. There was no statistically significant difference between the alive and deceased patients in any of the demographic or clinical variables. Conclusions: Mortality among schizophrenia patients in this rural cohort is considerably lower than patients from developed countries. Nevertheless, nearly two-fold excess mortality in schizophrenia calls for attention to their medical and psychosocial needs.

Key words: Mortality, schizophrenia, standardized mortality ratio

INTRODUCTION

Patients with schizophrenia have higher mortality rates compared to general population. A recent systematic review reported the median all-cause standardized mortality ratio (SMR) of schizophrenia to be 2.58.¹

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This demonstrates a more than 2½-fold excess mortality among schizophrenia patients across the globe. This systematic review included 22 studies from developed countries, 3 studies from emerging economies, and 1 from least developed countries. Medical diseases, unhealthy lifestyle, substance misuse, poor compliance or treatment refusal, and among unnatural causes, suicide are among the major causes of this excess mortality.\(^{[1,2]}\)

Mortality is an important long-term outcome in any chronic disorder. Though there have been many studies examining the outcome of schizophrenia in India, mortality has not been well-studied. Only two reports have provided systematically collected data on mortality in cohorts of schizophrenia patients in India: (1) Dube \textit{et al.}, reported SMR of 2.3 and 4.5 in males and females, respectively in their 13-14 years follow-up of a cohort of 140, of which complete information was available only in 62 patients. (2) Harrison \textit{et al.}, report SMRs of 1.9, 1.86, 1.88, and 3.02 in Madras, Agra, Chandigarh urban, and Chandigarh rural centers. Most of the patients in these studies were treatment-seeking individuals from urban centers (except Chandigarh rural, where treatment-seeking rural individuals were included). A substantial number of patients with schizophrenia in India does not seek treatment. This is particularly so in rural places, which constitute more than 70% of India’s population. Studies conducted in the urban centers including treatment-seeking patients cannot be generalized to them.

Our team has been running a community intervention program in Thirthahalli taluk of South India for the past 9 years. In this, we have been identifying, treating, and following up all patients with schizophrenia in the entire taluk. In this study, we report mortality experience in this cohort of patients by estimating the SMRs over 3 years.

**MATERIALS AND METHODS**

**Setting and subjects**

Thirthahalli is a taluk of Shimoga district of Karnataka. The taluk consists of 1324 villages and a town that serves as the headquarters. The town has a population of 14 357, and the total population of the Taluk is 141,453 according to the 2011 Census.\(^{[3]}\) Community dwelling patients in the whole taluk formed the subjects for this study. The details of case identification are mentioned elsewhere.\(^{[4]}\) Briefly, the research team, along with the help of the local health administration, used key informant method for this purpose. Once identified, each patient would be screened by a qualified psychiatrist who also would use mini international neuropsychiatric interview;\(^{[5]}\) to confirm the diagnosis.

During the initial 2 years, the number of recruitments per year increased and then started to stabilize [Table 1]. Once diagnosed, each patient is offered pharmacotherapy along with a psychoeducation to the patient and family members. No structured psychosocial intervention is being offered. Patients/family members are encouraged to continue care with the research team or with other mental health professionals of their choice. All efforts are being made to keep the patients under regular follow-up using communication through letters, telephones, and home visits. During the follow-up visits, along with the routine assessments, Positive and Negative Syndrome Scale (PANSS)\(^{[6]}\) and Indian Disability Assessment, and Evaluation Scale (IDEAS; Rehabilitation Committee of the Indian Psychiatric Society, 2002)\(^{[7]}\) are administered to assess the symptom severity and disability respectively at a frequency of once in 6 months. The cohort is followed up with the help of different project funds, each of which is approved by the National Institute of Mental Health and Neurosciences Ethics Committee.

**Mortality data of patients**

The research team constantly updates the information regarding mortality as and when the deaths occur. The cause of death also is determined during this process. The medical records available with the family members and the oral information regarding the cause of death are the sources. This process of enquiry into the details of death occurs only if the family members consent. For the purpose of this study, we took into account patient population during the years 2009-2011, when the number of patients in the cohort was stabilized.

**Mortality data of the general population**

Mortality rates (crude death rates [CDRs]) of the general population of Shimoga district for 2009, 2010, and 2011 were used to calculate the SMRs. The CDR was obtained from the civil registration system of the Government of Karnataka.\(^{[8]}\) However, general population mortality data for the Thirthahalli taluk \textit{per se} as well as age- and gender-specific death rates were not available.

**Table 1: Number of cases from 2005 to 2011**

| Year | Number of cases |
|------|----------------|
| 2005 | 94             |
| 2006 | 225            |
| 2007 | 270            |
| 2008 | 290            |
| 2009 | 301            |
| 2010 | 317            |
| 2011 | 325            |
| 2012 | 336            |
Calculation of standardized mortality ratios
SMRs were calculated for each of the above mentioned years in the using the formula, SMR = (Observed deaths/ expected deaths) × 100.\[9\] Initially, CDR (per 1000) was multiplied by the number of patients in that year to arrive at the number of expected deaths for that particular year. As the next step, the observed number of deaths was divided by the number of expected deaths. The value was then multiplied by 100 to arrive at the SMR for that particular year. Sociodemographic and clinical variables (i.e., duration of illness, symptom severity, disability, adherence pattern, and the course of the illness) were compared between the patients who had died and those who were alive. Statistical Package for Social Sciences version 15 (SPSS Inc., 233 South Wacker Drive, 11th Floor, Chicago) was used for the analysis. For the deceased patients, their last available data were taken for comparison. For living patients, we had six assessments (2 per year) of PANSS and IDEAS. We used the average values of these six assessments for comparison with that of the deceased group. Owing to the low number of patients in the deceased group, nonparametric tests were used. Mann-Whitney U-test was used to compare the continuous variables, and the Fisher’s exact test was used to compare the discrete variables.

RESULTS
Between the years 2009 and 2011, there were 12 total deaths in the patient population. Table 2 gives the details regarding the SMRs for these years separately. Table 3 gives details regarding the causes of mortality in patients. These indicate that compared to the mortality experience of the general population, the percentage excess of mortality in patients were 44, 78, and 116 for the years 2009, 2010, and 2011, respectively. The average SMR for all the 3 years taken together was 179.48, indicating about two-fold excess mortality among schizophrenia patients.

Table 3: Details regarding causes of death

| Causes of death | Frequency (%) |
|-----------------|--------------|
| Medical*        | 6 (50)       |
| Suicide         | 4 (33.3)     |
| Accident        | 1 (8.3)      |
| Unknown         | 1 (8.3)      |
| Total           | 12           |

*Medical causes included cardiovascular, respiratory, renal and infectious, severe anemia and other causes (one cause for each patient)

DISCUSSION
This study conducted in a rural South Indian community shows that the mortality of schizophrenia patients is substantially higher when compared to that of the general population. Overall, patients experienced 40-116% more mortality than the general population. Notably, one-third (33.3%) of patients had died by committing suicide. Three of them had very poor social support (apart from immediate caregivers, they did not have any other avenue for financial or emotional support.

Table 4 gives the comparison of sociodemographic and clinical details of the deceased patients and those who have survived through these years. There was no difference between the two groups.

Table 4: Comparison of sociodemographic and clinical variables between deceased and living patients

| Particulars                          | Deceased patients | Alive patients | Mean rank for the deceased patients/\(\chi^2\) | Mean rank for the alive patients/\(\chi^2\) | \(P\)  |
|-------------------------------------|-------------------|----------------|---------------------------------------------|---------------------------------------------|------|
| Mean age in years (SD)              | 45.1 (10.9)       | 39.2 (11.9)    | 192.1                                       | 149.82                                      | 0.1  |
| Mean duration of education in years (SD) | 3.9 (4.4)       | 6.3 (4.8)      | 80.50                                       | 111.3                                       | 0.15 |
| Mean age at onset (SD)              | 35.8 (14.3)       | 29.2 (10.7)    | 183.0                                       | 143.4                                       | 0.12 |
| Mean total baseline PANSS score (SD) | 65.3 (16.0)      | 66.2 (23.3)    | 109.6                                       | 106.4                                       | 0.9  |
| Mean baseline total IDEAS score (SD) | 8.2 (3.3)        | 7.1 (4.1)      | 168.9                                       | 144.0                                       | 0.3  |
| Gender (n [%])                      |                   |                |                                             |                                             |      |
| Males                               | 66.7              | 50.3           |                                             |                                             | 0.268|
| Females                             | 33.3              | 49.7           |                                             |                                             |      |
| Adherence pattern in follow-up      |                   |                |                                             |                                             |      |
| 76-100%                             | 57.1              | 70.7           |                                             |                                             | 0.7  |
| 51-75%                              | 28.6              | 17.7           |                                             |                                             |      |
| 26-50%                              | 0                 | 5.1            |                                             |                                             |      |
| <25%                                | 14.3              | 6.6            |                                             |                                             |      |

\(SD\) – Standard deviation; PANSS – Positive and Negative Syndrome Scale; IDEAS – Indian Disability Assessment and Evaluation Scale
population during the 3 years of observation. In other words, mortality among the patients was 1.4-2.16 times higher than that of the general population. A detailed discussion regarding specific causes of death is not appropriate, given the small number of deaths in this cohort. Nevertheless, it is notable that one-third (4 of 12) of deaths were due to suicide. The proportion of deaths attributable to suicide in the general population in this region is not available. However, only 3% of deaths among individuals older than 15 years are attributed to suicide in India. Thus, the proportion of deaths due to suicide is substantially higher among schizophrenia patients in this cohort. This is consistent with literature from India and elsewhere. Notably, three out of four suicide patients had no social support.

SMR for schizophrenia is reported to be 2.8 in developed countries where the medical and other treatment facilities are expectedly excellent. In a country such as India where the treatment gap is up to the tune of 80%, we had expected a substantially higher SMR for patients especially for rural community dwelling patients. Though, the data indicate substantially greater mortality experience for patients (1.4-2 times than the general population), it is to be noted that SMR is substantially less when compared to the developed countries. This issue gives more support toward the observation that schizophrenia outcomes are relatively better in India.

The issue of comparison between the living patients and deceased patients deserves mention here. This seemingly improbable lack of difference among demographic and clinical variables could be attributed to the issue of extremely small number in the deceased group when compared to the other group. A detailed qualitative assessment of the circumstances of death in each of the 12 cases could provide important clues regarding potentials for prevention. Such a description, however, is beyond the scope of this paper. Substance use is purported to be associated with excess mortality in the developed countries. However, this may not be the case in this cohort. None of the suicide patients had any history of substance use. Their social support, however, was extremely poor. Apart from the immediate caregivers, they had no other avenue for financial or other kinds of supports.

Our study has certain strengths. This cohort included patients from the entire taluk, and they were all community living. Care has been taken to include nearly all cases of schizophrenia in our cohort. As described elsewhere, the proportion of missed out cases is not likely to be more than 17%. Hospital-based studies would not have given a complete picture; this makes the findings of this study more generalizable to the community. Findings of this study have a lot of practical implications as India is a predominantly rural country. The diagnosis was made by psychiatrists using standard diagnostic instruments; the stability of diagnosis was confirmed by revising the diagnosis during follow-up and excluding patients with a change in diagnosis.

The findings of the study need to be viewed with some caveats. First, SMR was computed using mortality data from the district, as, despite our best efforts, we could not locate data from the taluk. Second, in the absence of age- and sex-specific mortality data, SMR was calculated based on CDR. In this context, it is to be noted that the other two reports on Indian cohorts have in fact used national mortality statistics in calculating SMRs for patients selected from individual centers. Third, the cause of death was ascertained based on the reports of the family members; death certificates were not available in most of the cases. Hence, the exact cause of death remains conjectural. It may be noted here that even other studies from India have assessed causes of death using reports from family members. Finally, the comparison between the deceased and surviving patients suffered from a lack of adequate power due to a small number of deaths. Mortality in such cohorts is a rare event, and to perform statistical analysis with adequate power, thousands of patients should be followed up for several years. Such studies are prohibitively expensive to conduct, especially in resource poor countries, particularly, given the fact that mental health care attracts the least priority from the policy makers. As there is the little scope of a large-scale study, information from intensively followed up cohorts like this provide invaluable insights into such important outcomes like mortality.

CONCLUSIONS

This rural community-based study shows that the mortality in schizophrenia patients can be 1½-2 times more than that of the general population. The causes for this mortality include both natural (medical) and unnatural causes (suicide). Though, the mortality in patients is higher than that of the general population, it is relatively lower when compared to the mortality experiences of Western developed countries. Nevertheless, the significantly high mortality experience of schizophrenia patients warrants urgent attention from all stakeholders.

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Conflicts of interest
There are no conflicts of interest.
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