CHAPTER - 7

An epidemiological study of schizophrenia
7.1 Introduction

- According to the World Health Report 2001 published by WHO, 24 million people suffer from schizophrenia all over the world.
- Murray (2002) states that around 8 million people in India suffer from schizophrenia.
- Schizophrenia is the third most disabling disease in the world with an occurrence rate of 0.1 to 0.4 per 1000 population per year (The World Health Report, 2001).

The enormity of the problem of schizophrenia has been discussed at length in Chapter 1. In the preceding chapters, various aspects of schizophrenia have been studied from a mathematical perspective; various models have been formulated and results obtained accordingly. In this chapter, another important aspect of the disease viz., the epidemiological aspect, has been taken up for discussion. Indeed, schizophrenia has long held the attention of psychiatric epidemiologists. Till date, several epidemiological studies have been carried out on the course, outcome, symptoms etc. of schizophrenia by various researchers of medical science all over the world. In fact, all major studies done on schizophrenia have been on epidemiology as has been evident from the review
of literature given in Chapter 1. Hence, this chapter has been devoted to the study of some of the aspects of the epidemiology of schizophrenia.

In the first part of this chapter, an idea of the world epidemiology of schizophrenia, as obtained from available literature, has been presented. Some records on the incidence, prevalence, expectancy, the course and outcome of the disease, and studies on other demographic factors like age, sex, genetic link etc. have been included.

In the second part of the chapter, the results of a study conducted as a part of this research to gather an idea about the local scenario of schizophrenia, and to investigate its conformity with the global situation has been presented. Some aspects like the prevalent age and sex distributions, the influence of genetic factors, education etc. on schizophrenia, the co-existence of alcohol and drug abuse with schizophrenia and the occurrence of symptoms at onset have been studied from the collected data. In addition, some studies applying the theories conceptualized in the previous chapters have also been incorporated. These include

(i) a study on the association between the regularity in the treatment process and the response shown

(ii) the behaviour of three important symptoms usually manifest in schizophrenia and

(iii) a computation of the persistence scores of all the relevant symptoms.
It needs to be mentioned here that this study is just an attempt at the study of epidemiology and by no means a complete and technically perfect one. However, properly designed clinical trials in the direction suggested in this study should prove to be of considerable importance.

7.2 Part I: A glimpse of the world epidemiology of schizophrenia

Psychiatric epidemiology is traditionally concerned with patterns of psychopathology in human population groups and the factors which influence these patterns. It examines the occurrence of pathology in terms of time, place and individual characteristics in order to elucidate the etiology of illness and its population burden. In terms of schizophrenia, such research includes studies of prevalence and incidence, natural history of illness including risk and protective factors for onset, remission and relapse, longitudinal follow up of population at high risk for schizophrenia including children of parents with schizophrenia or relatives of a proband with schizophrenia and genetic epidemiology including twin, family, association and linkage studies in samples that are representative of persons with schizophrenia or a population isolate with a high prevalence of the disorder. In this section, an attempt has been made to incorporate some results which would give a fairly good idea of some of the above mentioned factors.
7.2.1 Diagnostic Criteria: Classificatory systems

As mentioned in Chapter 3, diagnostic uncertainty and prevailing unreliability in diagnostic procedure made attempts at international comparison and compiling of data very difficult. This led to the concentrated international efforts at developing a standardised classificatory system.

The World Health Organisation developed the "International Classification of Disease, injuries and causes to death" (ICD) in 1950. It contains the official system for recording all diseases, injuries, impairments, symptoms and causes of death. Ten editions, ICD I through ICD 10 have been published so far.

After publication of ICD II, because of various ideological and practical problems, the American Psychiatric Association developed their own classificatory system, the "Diagnostic and Statistical Manual" (DSM) in 1952. As on today, 4 editions have been published, the latest being DSM IV.

These two classificatory systems are comparable and have considerable similarities and are found to be equally useful.

7.2.2 Diagnostic Assessment Instruments

Identification of persons with mental illness in the community regardless of treatment status or severity of disorder is the ultimate test of a diagnostic classification system. Unfortunately, for many years the lack of reliable diagnostic criteria hindered the ability of epidemiologists to identify cases in the community and the prevalence rate were usually based on treated cases only.
In the 1970s, several psychiatric interviews were developed.

1. SADS: Schedule for Affective Disorders and Schizophrenia
2. RDC: Research Diagnostic Criteria
3. PSE: Present State Examination
4. PERI: Psychiatric Epidemiological Research Interview
5. RDI: Renard Diagnostic Interview

However none of these interviews were entirely suitable. Then the Diagnostic Interview Schedule (DIS) was developed incorporating DSM III criteria for use in the National Institute of Mental Health Epidemiological Catchment Area (NIMH ECA) Program. It was a highly structured interview based on respondent self-report only, which did not allow interviewer discretion. Diagnoses were generated by computer algorithm viz., CATEGO and hence DIS was suitable for administration by non-clinician interviewers and used in large surveys for relatively low cost. The DIS has undergone subsequent revisions to incorporate DSM III–R and DSM IV diagnostic criteria and has been translated to over twenty languages.

The need for a comprehensive diagnostic instrument for use in cross-cultural and comparative studies worldwide led to the development of Composite International Diagnostic Instrument (CIDI), developed jointly by WHO and the U.S. Alcohol, Drug Abuse and Mental Health Administration. The CIDI, like the DIS remains a highly structured diagnostic interview with diagnoses made via computer algorithm.
Over the years, some more technically sound schedules have been framed catering to different mental illnesses. The following can be included to name a few:

- **SCAAPS**: Schedule for the Assessment of Acute Psychotic States.
- **PPHS**: Psychiatric and Personal History Schedule.
- **DPS**: Diagnostic and Prognostic Schedule.
- **SCAN**: Schedule for Comprehensive Assessment in Neuropsychiatry.
- **SRQ**: Self Reporting Questionnaire.
- **IPDE**: International Personality Disorder Examination.
- **WHOQOL**: World Health Organization Quality of Life Instrument.
- **WHODAS**: World Health Organization Disability Assessment Schedule.

Another difficult problem is the influence of culture in interpretations and evaluation of individual symptoms. Certain questions devised by a western researcher, at times become unintelligible and at times invalid in some other country. As such attempts were made to prepare culture-free schedules. But so far only culture-fair schedules could be devised for international use.

### 7.2.3 Community Surveys

The four community surveys that are the spear headers and are most frequently cited for data on the prevalence and incidence of schizophrenia are
1. **International Pilot Study of Schizophrenia (IPSS)**

The IPSS was the first large scale multinational cross-cultural study of psychiatric disorders carried out to understand the international epidemiology of schizophrenia, in 1973. It was a WHO sponsored prospective study of 1202 patients carried out across 9 countries viz., Aarhus (Denmark), Agra (India), Cali (Columbia), Ibadan (Nigeria), London (England), Moscow (USSR), Taipei (China), Washington DC (USA) and Prague (Czechoslovakia).

2. **NIMH Epidemiological Catchment Area (ECA) Program**

This is the largest survey of mental disorders ever undertaken in the United States where a total of 18,571 household residents and 2290 institutional residents (nursing homes, jails and psychiatric hospitals) aged 18 and above were sampled in five areas viz., New Haven, Baltimore, Durham, St. Louis and Los Angeles.

3. **WHO Collaborative Study on the Determinants of Outcome of Severe Mental Disorders (DOSMeD)**

This study was conducted at 12 field centres in 10 countries across the world of individuals aged 15 to 55 years old with a final cohort of 1379. It is noteworthy that 2 centres were set up in India where, one in Chandigarh and the other in Agra. The other sites include Aarhus (Denmark), Cali (Columbia), Dublin (Ireland), Honolulu and Rochester (USA), Ibadan (Nigeria), Moscow (USSR), Nagasaki (Japan), Nottingham (UK) and Prague (Czechoslovakia).
4. National Comorbidity Survey (NCS)
This was conducted in the early 1990s by the Institute of Social Research at the University of Michigan using a nationally representative household sample of 15 to 54 year olds.

7.2.4. Incidence, Prevalence, Expectancy
In epidemiology, a population is a collection of individuals defined by time, place and characteristics such as age, sex and race. Point prevalence is defined as the number of persons in a population who are affected with a disorder at a given point of time. Incidence is defined as the number of persons without a disorder at the beginning of a given time period who subsequently develop the disorder in that time period (usually 1 year). A “true” incident case has never had a previous episode of the disorder however a “recurrent” case has had a previous episode. Period prevalence includes existing cases at the beginning of the time period (point prevalence) plus all incident cases developing in the time period. Lifetime prevalence refers to the proportion of a given population who either has an active illness or has had history of the illness.

An important concept in epidemiology is that prevalence is proportional to incidence and duration

\[ P \propto I \times D \]

Thus in a chronic case such as schizophrenia, a steady prevalence is maintained by a long duration of illness despite a relatively low incidence rate. With
incidence remaining unchanged, shorter the duration of illness, the lower will be the prevalence of the condition.

Expectancy, also called lifetime risk or morbid risk, is a theoretical statistic calculated from prevalence data (Reid, 1960) or incidence data (Jablensky et al, 1992) that reflects the probability of healthy individuals becoming ill with a specific disease if they survive or live through the relevant period of highest risk.

The results of incidence, prevalence and expectancy of schizophrenia as obtained from the above mentioned studies as also from some other noted epidemiological studies are shown in the following table. It needs to be mentioned here that there have been umpteen similar studies but it would be impossible to include all the results in this small chapter.

Table 7.1  Literature Review of Incidence, Prevalence and Expectancy Rates of Schizophrenia

<table>
<thead>
<tr>
<th>Rate</th>
<th>Range (Low–High)</th>
<th>Reference</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCIDENCE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.34/1000</td>
<td>0.11 – .75</td>
<td>Eaton, 1985</td>
<td>Review of 12 studies in 6 countries; higher rates in US (.30 - .70) than elsewhere (.11 - .25); crude rates</td>
</tr>
<tr>
<td>0.25/1000</td>
<td>-</td>
<td>Castle et al, 1991</td>
<td>Follow-up study in London, UK</td>
</tr>
<tr>
<td>0.44/1000</td>
<td>0.11 – 2.26</td>
<td>Jablensky et al, 1992</td>
<td>Review of 12 studies in 10 countries; mixed rates (both crude &amp; specific) WHO (DOSMed)</td>
</tr>
<tr>
<td>2/1000</td>
<td>-</td>
<td>Tien and Eaton, 1992</td>
<td>Five epidemiologic Catchment Area Program sites, USA</td>
</tr>
</tbody>
</table>
### PREVALENCE: POINT, PERIOD AND LIFETIME

<table>
<thead>
<tr>
<th>Rate</th>
<th>Range</th>
<th>Study Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3/1000</td>
<td>1.5 - 4.2</td>
<td>Cooper, 1978; Review of 15 studies in 12 countries; crude rates</td>
</tr>
<tr>
<td>3.7/1000</td>
<td>0.6 - 8.3</td>
<td>Eaton, 1985; Review of 20 studies in 12 countries; point, period and lifetime rates show only small differences; mixed rates</td>
</tr>
<tr>
<td>5/1000</td>
<td></td>
<td>Kessler et al, 1994; Period prevalence; US National Comorbidity Survey</td>
</tr>
<tr>
<td>5.4/1000</td>
<td>1.4 - 17</td>
<td>Jablensky et al., 1992; Review of 16 studies in 8 countries; mixed rates</td>
</tr>
<tr>
<td>5.5/1000</td>
<td>1.9 - 17.9</td>
<td>Nakane et al, 1992; Review of 16 studies in Japan</td>
</tr>
<tr>
<td></td>
<td>0.6 - 7.1</td>
<td>Karno &amp; Norquist, 1989; Point prevalence; review of 10 studies</td>
</tr>
<tr>
<td></td>
<td>3.6 - 7.3</td>
<td>Karno &amp; Norquist, 1989; 3 – 6 month period prevalence; review of 4 studies</td>
</tr>
<tr>
<td></td>
<td>2.7 - 7.0</td>
<td>Karno &amp; Norquist, 1989; 12 month period prevalence; review of 7 studies</td>
</tr>
<tr>
<td></td>
<td>0.9 - 11.0</td>
<td>Karno &amp; Norquist, 1989; Lifetime prevalence; review of 21 studies</td>
</tr>
<tr>
<td>8.8/1000</td>
<td>4 - 13</td>
<td>Burnham et al., 1987; NIMH ECA study (Period Prevalence)</td>
</tr>
<tr>
<td>13/1000</td>
<td>6 - 19</td>
<td>Karno &amp; Norquist, 1989; NIMH ECA study (Lifetime Prevalence)</td>
</tr>
</tbody>
</table>

### EXPECTANCY

<table>
<thead>
<tr>
<th>Rate</th>
<th>Range</th>
<th>Study Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.3/1000</td>
<td>3.6 - 26.8</td>
<td>Jablensky et al., 1992; Review of 13 studies in 6 countries; mixed rates</td>
</tr>
<tr>
<td></td>
<td>7.0 - 30.0</td>
<td>Cooper, 1978; &lt;10 in non-US countries; &gt;10 in US with differences likely due to diagnostic criteria and bias</td>
</tr>
</tbody>
</table>
Literature Review of Incidence, Prevalence and Expectancy Rates of Schizophrenia in India

<table>
<thead>
<tr>
<th>Rate</th>
<th>Reference</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCIDENCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.72/1000</td>
<td>Jablensky et al.</td>
<td>Review of 12 studies in 10 countries; mixed rates (both crude &amp; specific)</td>
</tr>
<tr>
<td></td>
<td>1992</td>
<td>WHO (DOSMeD); rates calculated using broad diagnostic criteria</td>
</tr>
<tr>
<td>.35/1000</td>
<td>Rajkumar et al,</td>
<td>Study of urban community in Chennai (formerly, Madras)</td>
</tr>
<tr>
<td></td>
<td>1993</td>
<td></td>
</tr>
<tr>
<td>EXPECTANCY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.2/1000</td>
<td>Jablensky et al.</td>
<td>Review of 12 studies in 10 countries; mixed rates (both crude &amp; specific)</td>
</tr>
<tr>
<td></td>
<td>1992</td>
<td>WHO (DOSMeD); rates calculated using broad diagnostic criteria</td>
</tr>
</tbody>
</table>

Conclusion from Table 7.1

From Table – 7.1 it is seen that prevalence rates of schizophrenia are larger than incidence rates and reflect an occurrence of 5 cases per 1000 population. Eaton (1985), in reviewing prevalence studies of schizophrenia concludes that the different types of prevalence measures (point, period and lifetime) provide similar estimates of occurrence of schizophrenia and he suggests that this is due to the chronic, but not fatal, nature of schizophrenia. The expectancy of schizophrenia is popularly referred to as about 1 % (i.e., 10 per 1000 population). Cooper (1978) notes that expectancy rates of schizophrenia are
often higher in the United States than in the other countries. This might be due to the diagnostic bias in American Psychiatry towards a broad conceptualization of schizophrenia compared to the more restricted conceptualizations found in other countries (Karno and Norquist, 1989). This conclusion is also upheld by the NIMH ECA program (Robins and Regier, 1991) and WHO Ten country study “Schizophrenia: Manifestations, Incidence and Course in Different Cultures” (Jablensky et al, 1992). The latter study also established that coordinated multicenter cross-cultural research studies of schizophrenia could occur successfully and schizophrenia across the cultures studied showed similar behaviour, patterns and symptoms.

Some similar results:

- Jablensky, in his paper on recent epidemiologic issues (1995) cites many studies conducted in Europe by various researchers like Castle, Kendall, Stoll, Harrison etc. which show changes (usually a decline) in the incidence rates of schizophrenia over the years and the reasons thereof.

- The WHO DOSMeD study upheld the view that the outcome of schizophrenia in developing countries is more favourable compared to that seen in developed countries. For eg., in one of the multi-site studies, the proportion of patients of schizophrenia showing full remission at 2 years was 63% in developing countries compared to 37% in developed countries (Jablensky et al, 1992).
• Similar opinions had been put forward by many international follow-up studies. Murphy and Raman (1971) conducted a long term follow-up study of schizophrenics in Mauritius and came up with the findings that ethnic Africans and Indians of Mauritius had a more favourable course and outcome of the disease with fewer relapses compared to white Europeans.

• The above study inspired Indian psychiatrists like Wig, Varma, Dube, Kulhara, Chandiramani, Thara and Rajkumar, to name a few, to do extensive research on the course and outcome of schizophrenia and other aspects of the illness by conducting long term follow-up studies. That schizophrenia follows a less severe course in developing countries have been demonstrated, among others, by Kulhara and Wig (1978) and Thara and Eaton (1996).

7.2.5 Study of Socio-demographic correlates in the NIMH ECA Program

Table 7.2 Socio-demographic Correlates of 1 Month Prevalence of Schizophrenia in the NIMH ECA Program

<table>
<thead>
<tr>
<th>Correlates</th>
<th>Unadjusted Rate, % (SE)</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 – 24</td>
<td>0.8 (0.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>25 – 44</td>
<td>1.1 (0.2)</td>
<td>2.31</td>
</tr>
<tr>
<td>45 – 64</td>
<td>0.5 (0.1)</td>
<td>0.76</td>
</tr>
<tr>
<td>≥ 65</td>
<td>0.1 (0.1)</td>
<td>0.10</td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th>Sex</th>
<th>Male</th>
<th>Female</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.7 (0.1)</td>
<td>0.7 (0.1)</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>0.80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race or Ethnicity</th>
<th>Black</th>
<th>Hispanic</th>
<th>Non-Black and non-Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.2 (0.2)</td>
<td>0.4 (0.2)</td>
<td>0.6 (0.1)</td>
</tr>
<tr>
<td></td>
<td>0.86</td>
<td>0.57</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Married</th>
<th>Single</th>
<th>Separated or divorced</th>
<th>Widowed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5 (0.1)</td>
<td>1.1 (0.2)</td>
<td>1.5 (0.3)</td>
<td>0.4 (0.2)</td>
</tr>
<tr>
<td></td>
<td>1.00</td>
<td>2.55</td>
<td>2.61</td>
<td>2.27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Socioeconomic Status</th>
<th>1 High</th>
<th>2 Upper middle</th>
<th>3 Lower middle</th>
<th>4 Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3 (0.1)</td>
<td>0.6 (0.2)</td>
<td>0.9 (0.1)</td>
<td>1.2 (0.2)</td>
</tr>
<tr>
<td></td>
<td>1.00</td>
<td>2.28</td>
<td>3.96</td>
<td>8.14</td>
</tr>
</tbody>
</table>

Source: Freedman et al., 2000

Conclusion from Table 7.2

In the above table, the unadjusted rates represent the prevalence of schizophrenia as it actually appears in the community. The odds ratio gives the rate after correcting for differences in age, sex, race, marital status and socioeconomic status among groups. From the table it has been inferred that:

1. Persons over 65 years of age are significantly less likely than persons between 18 – 25 years to have a diagnosis of schizophrenia. Persons aged 25 – 44 are twice as likely to be diagnosed as schizophrenics.

2. No difference was noticed between prevalence of schizophrenia among males and females.
3. Although blacks had twice the rate of schizophrenia in the community compared to other ethnic groups, when adjusted for socioeconomic status, age, sex etc., this difference disappeared.

4. Association between schizophrenia and marital status has also been demonstrated.

5. There was an eight-fold increase in the odds of having schizophrenia in the lowest socioeconomic group compared to the highest group.

7.2.6 Study of Comorbidity of Schizophrenia with Substance Use Disorders

Both the ECA and the NCS have demonstrated extremely high lifetime comorbidity of the psychotic disorders and substance use disorders. 50% to 60% of persons with schizophrenia had a comorbid alcohol or drug abuse diagnosis. The figures obtained in the ECA study are presented in the following table.

Table – 7.3 Comorbidity of Schizophrenia with Substance Use Disorders in the ECA Program

<table>
<thead>
<tr>
<th>Comorbid Disorder</th>
<th>Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol dependence</td>
<td>24.0</td>
</tr>
<tr>
<td>Any alcohol use disorder</td>
<td>33.7</td>
</tr>
<tr>
<td>Drug dependence</td>
<td>12.9</td>
</tr>
<tr>
<td>Any drug use disorder</td>
<td>27.5</td>
</tr>
<tr>
<td>Any drug or alcohol use disorder</td>
<td>47.0</td>
</tr>
</tbody>
</table>

Source: Freedman et al., 2000
7.2.7 Risk Factors

A "risk factor" for schizophrenia is an inherent or acquired characteristic or an external condition associated with an increased probability of developing schizophrenia. Epidemiological studies in schizophrenia seek to determine the most important risk factors for this disorder.

Risk factors are categorised in different ways:

1. Demographic and concomitant factors (age, sex, race, social class etc.)
2. Precipitating factors that operate immediately before the onset of schizophrenia (life events, migration etc.)
3. Predisposing factors that act for a long period of time or during an earlier part of life (genes, perinatal complications, infections)

Several studies have been conducted to ascertain the risk factors of schizophrenia and thereby develop standard diagnostic criteria for selection of schizophrenia cases. Following are some of the important results obtained:

1. Genetic Factors

Genetic influence on schizophrenia has been demonstrated profoundly.

1. Twin studies have shown a concordance of 33% - 78% among monozygotic twins, but of only 8 - 28% in dizygotic twins.

2. Family studies reveal that
   a) First-degree relatives of a person with schizophrenia have approximately five to tenfold chance of developing schizophrenia than non relatives.
b) Children with both parents schizophrenic have 35% chance of developing schizophrenia but only 1% chance if none of the parents are schizophrenic.

c) Adopted-away children of persons of schizophrenia are at increased risk of schizophrenia.

The role of environment in the above findings can not be ignored. It is noted that

1. Monozygotic twins may have greater environmental similarity.

2. Relatives also experience greater environmental similarity.

To minimize environmental influence, the adoption studies were conducted which again emphasized the influence of genes on development of schizophrenia.

The approximate lifetime expectancy of developing schizophrenia for relatives of schizophrenics is shown in the following table.

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Risk (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Definite cases only</td>
</tr>
<tr>
<td>Parents</td>
<td>4.4</td>
</tr>
<tr>
<td>All Siblings</td>
<td>8.5</td>
</tr>
<tr>
<td>Siblings (one parent schizophrenic)</td>
<td>13.8</td>
</tr>
<tr>
<td>Children</td>
<td>12.3</td>
</tr>
<tr>
<td>Children (both parents schizophrenic)</td>
<td>36.6</td>
</tr>
<tr>
<td>Half siblings</td>
<td>3.2</td>
</tr>
<tr>
<td>Nephews and nieces</td>
<td>2.2</td>
</tr>
</tbody>
</table>

2. Age
Contrary to prior belief that onset of schizophrenia is well below 45 years in both men and women, recent data have revealed that schizophrenia could also begin after 45 years of age. The ECA study confirms that schizophrenia remains undiagnosed in the elderly as the disease has a different presentation in this age group. However, schizophrenia is most common between ages 15 to 45.

3. Sex
As seen earlier the male to female ratio of prevalence of schizophrenia is close to 1, but on examination of different age cohorts it was found that men are most likely to have the onset of symptoms between ages 15 and 25 and women are at highest risk between ages 25 to 35. The World Health Report, 2001 states that schizophrenia is found approximately equally in men and women, though the onset tends to be later in women who also tend to have a better course and outcome of the disease. The WHO DOSMeD findings also report that schizophrenia in men may have a more chronic and disabling course. These findings are however not conclusive and no reason could be ascertained for the above mentioned differences.

4. Birth and Foetal Complications
It has been found that persons with schizophrenia, especially male infants experience greater number of birth complications. Some studies have reported a relationship between perinatal complications and early onset of the disease,
negative symptoms and poorer prognosis. Again there is a general trend toward psychopathology in persons who have suffered from obstetrical complications.

5. **Social Class**
The prevalence of schizophrenia has been found to be higher among members of lower than higher social classes.

6. **Marital Status**
Reports have shown higher rates of schizophrenia for unmarried than married patients and some have inferred that single status leads to schizophrenia. But it might also be that the disease lessens the chance of marriage. These results are however non conclusive. On the basis of a 10 year prospective follow-up study, Thara and Srinivasan (1997) commented that the marital rate in schizophrenia was 70% with more men remaining single and more women suffering broken marriages.

7. **Life Stressors**
The association between stressful life events (loss of job, divorce, etc.) and the etiology and course of schizophrenia has been much studied (Kuipers and Bebbington, 1990). Schizophrenia often follows extraordinary stress, so it has been suggested that stress might provoke acute schizophrenia in healthy persons. Butzlaff and Hooley (1998) have demonstrated that expressed emotionality can predict the course of schizophrenia, including relapses.
8. Suicide Risk
Suicide is a leading cause of mortality in people suffering from schizophrenia. Estimates vary, but as many as 10% of people with schizophrenia may die because of suicide attempts (Caldwell & Gottensman, 1990). Further research is needed, however, for a better understanding of the risk factors that are most predictive of future suicide in people with schizophrenia and the possible remedies. A substantial number of individuals with schizophrenia attempt suicide at some time during the course of their illness. A recent study showed that 30% of the patients of schizophrenia attempted suicide at least once during their lifetimes (Radomsky et al, 1999).

Considering the importance of paying due attention to mental disorders, the World Health Organization had devoted the annual report of 2001 to mental health. Some points noted in the report are presented below.

7.3 World health report, 2001
In devoting The World Health Report 2001 to mental health, the WHO has made one clear, emphatic statement: “Mental health – neglected for far too long – is crucial to the overall well-being of individuals, societies and countries and must be universally regarded in a new light”

The theme of this report being “New understanding, New hope”, it brings forth a new understanding that offers real hope to the mentally ill, an understanding
how genetic, biological, social and environmental factors come together to cause mental and brain illness, an understanding on how inseparable mental and physical health really are and how their influence on each other is complex and profound.

The report aims to raise professional and public awareness of the real burden of mental and neurological disorders and the cost to humans in social and economic terms.

Some statistics available in the report state that

- An estimated 450 million people in the world suffer from mental or neurological disorders or from psychosocial problems.
- One person in every four will be affected by a mental disorder at some stage of life.
- 24 million people in the world suffer from schizophrenia.
- The Global Burden of Diseases, 2000 reports a point prevalence of 0.4% for schizophrenia.
- Schizophrenia causes a high degree of disability. In a recent 14 country study on disability associated with physical and mental conditions, active psychosis (schizophrenia) was ranked the third most disabling condition, higher than paraplegia and blindness, by general people (Ustun et al, 1999)
• The economic cost of schizophrenia to society is also large. In 1991, the estimated cost of schizophrenia to the United States was 19 billion US dollars in direct expenditure and 46 billion US dollars in lost productivity.
• Globally, schizophrenia reduces an affected individual's lifespan by an average of 10 years.

7.4 Part II: Results of Epidemiological Study of Schizophrenia from collected data

In this section, an attempt has been made to carry out a study of the local epidemiology of schizophrenia for an understanding of the prevalent situation in relation to the global scenario.

For this purpose, data was collected from the records of the Outpatients Department (OPD) of the Department of Psychiatry of Gauhati Medical College Hospital (GMCH) where the records are kept in lots of 100 data sheets pertaining to hundred consecutive patients visiting the OPD. However all lots do not contain completed records of 100 patients as some patients do not report to the doctor even after registering their names. In this study, 25 lots consisting of 2478 records were chosen at random from a period of 22 years ranging from 1985 to 2006. Out of these 2478 patients, 797 were found to be confirmed schizophrenics, which shows that of the various mental illnesses, schizophrenics constitute 32.2% of all the patients attending OPD, which is quite a significant number.
Another source of data is a follow-up study conducted in collaboration with some prominent psychiatrists of Guwahati. In this study, 200 patients of schizophrenia have been followed up for a period of three months. Record of the various symptoms manifested at the time of diagnosis and the response shown by these symptoms during the course of treatment has been maintained for each of the 200 patients, apart from recording some of their demographic characteristics. A sample of the record sheet has been given in Annexure 3.

A brief account of the two studies is presented below:

7.4.1 Area of study

It is to be noted that most of the patients recorded at the GMCH were from the lower part of Assam consisting of the districts of Kamrup, Nalbari, Barpeta, Goalpara, Kokrajhar, Nagaon and Darrang. Most of the patients belonged to the middle, lower middle and poor strata of the society. Hence this study is confined to the lower economic society of lower and central Assam. However, in the follow-up study, the patients belonged to all economic strata of the society though this study was also confined to a similar geographical area.

7.4.2 Sex

Of the 797 patients of schizophrenia attending OPD of GMCH, there were 516 males and 281 females. However this does not reveal greater prevalence of the disease among males. This difference could be due to the fact that fewer women are brought for treatment to the GMCH because in the second study, out of the
200 cases, 102 were males and 98 were females. In this case, the difference between the number of male and female patients is not at all significant. Hence, we cannot ascertain whether there is greater prevalence of the disease in any one of the sexes. This has also been stated in the literature of the world epidemiology of schizophrenia.

In all, records of 997 patients of schizophrenia have thus been collected of which there were 618 males and 379 females.

### 7.4.3 Age

The age distribution of the 997 patients at the time of onset of schizophrenia is shown in the following table:

**Table: 7.5: Age distribution of observed patients**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Age Group</th>
<th>Male No.</th>
<th>Male %</th>
<th>Female No.</th>
<th>Female %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Up to 15</td>
<td>10</td>
<td>1.6</td>
<td>6</td>
<td>1.6</td>
</tr>
<tr>
<td>2</td>
<td>15 – 20</td>
<td>82</td>
<td>13.3</td>
<td>64</td>
<td>16.9</td>
</tr>
<tr>
<td>3</td>
<td>20 – 25</td>
<td>144</td>
<td>23.3</td>
<td>62</td>
<td>16.4</td>
</tr>
<tr>
<td>4</td>
<td>25 – 30</td>
<td>138</td>
<td>22.3</td>
<td>63</td>
<td>16.6</td>
</tr>
<tr>
<td>5</td>
<td>30 – 35</td>
<td>122</td>
<td>19.7</td>
<td>84</td>
<td>22.2</td>
</tr>
<tr>
<td>6</td>
<td>35 – 40</td>
<td>73</td>
<td>11.8</td>
<td>68</td>
<td>17.9</td>
</tr>
<tr>
<td>7</td>
<td>40 – 45</td>
<td>19</td>
<td>3.1</td>
<td>15</td>
<td>3.9</td>
</tr>
<tr>
<td>8</td>
<td>45 and above</td>
<td>30</td>
<td>4.9</td>
<td>17</td>
<td>4.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>618</strong></td>
<td></td>
<td><strong>379</strong></td>
<td></td>
</tr>
</tbody>
</table>
Observations from Table 7.5

From the table it is seen that the prevalence of schizophrenia is high in the ages from 15 to 40 years. In males, the onset of the illness is seen to be highest in the age interval 20 – 35 years and in females, the higher scores are in the age groups 25 – 40. The WHO reports also state about the earlier onset of the disease in men. Some cases of the disease have been reported after 45 years of age but it is difficult to say whether it is the year of onset or whether it is an old undiagnosed case of schizophrenia. The age distribution obtained is in conformity with other studies mentioned earlier.

The results of Table 7.5 can be diagrammatically represented as follows:

Fig - 7.1: Age distribution at onset of schizophrenic patients
### 7.4.4 Co-morbidity of schizophrenia with substance abuse

An attempt was made to study the prevalence of substance abuse i.e., the use of tobacco, alcohol and narcotic drugs among the 797 schizophrenics attending OPD of GMCH. The results obtained are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Tobacco abuse:</td>
<td>96</td>
<td>24</td>
<td>120</td>
<td>15%</td>
</tr>
<tr>
<td>ii) Alcohol abuse:</td>
<td>134</td>
<td>17</td>
<td>151</td>
<td>19%</td>
</tr>
<tr>
<td>iii) Drug abuse:</td>
<td>81</td>
<td>8</td>
<td>89</td>
<td>11%</td>
</tr>
</tbody>
</table>

In all about 45% of the schizophrenics were observed to use either tobacco, alcohol or drugs in the form of cannabis (locally called bhang, ganja etc.) and others. This is in conformity with standard findings.
7.4.5 Genetic Factors

This study was conducted on the 797 patients taking treatment at the GMCH. On studying the family history of the patients, it was seen that 43% of the patients, both males and females, have some relatives with mental illness. The following table shows the percentage of the studied schizophrenic patients who have the specified types of relatives with psychotic illness.

Table: 7.6: Genetic associations in observed patients

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Type of Relative (Relationship with patient)</th>
<th>No. of psychotic cases reported</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Parents</td>
<td>80</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Grandparents</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Uncles / Aunts</td>
<td>56</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Siblings</td>
<td>124</td>
<td>15.6</td>
</tr>
<tr>
<td>5</td>
<td>Cousins (1\textsuperscript{st} and 2\textsuperscript{nd})</td>
<td>41</td>
<td>5.2</td>
</tr>
<tr>
<td>6</td>
<td>Children</td>
<td>7</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>340</strong></td>
<td><strong>42.7</strong></td>
</tr>
</tbody>
</table>

Fig – 7.3: Genetic linkages in schizophrenic patients
Observations on genetic influence

The results obtained are quite significant and conforming to standards. In our study, it was observed that more of maternal uncles, aunts and cousins were reported to have had mental illness. Among parents also, a greater number of mothers than fathers were reported to be patients of some kind of psychotic illness. However, siblings seem to be at greater risk of the illness as observed from the collected data. The percentage of reported children having psychosis of the patients studied is expectedly low as for most of the patients, their children have not yet reached the age at which schizophrenia manifests, or it could be that such patients either remain undiagnosed even though they possess the illness from a much earlier date or they remain at a sub-syndromal (sub clinical) level for a long period of time. From the data and from earlier studies as mentioned in chapter 1, it can be inferred that there is a strong genetic link in the occurrence of schizophrenia.

7.4.6 Marital Status

Study was also carried out on the marital status of the patients. It was observed that 68% of the female patients were housewives, the remaining 32% being below 22 years of age. A careful study showed that these married women were diagnosed as schizophrenics only after their marriage. It could be that the disease was undetected before their marriage or not divulged due to fear of remaining unmarried. Of the males, only 29% were married with 71% being
unmarried. However the number of patients below the marriageable age for males was also high. Hence this study is not very conclusive.

### 7.4.7 Education

The educational status of the 797 schizophrenics visiting GMCH is presented in the following table.

**Table 7.7: Educational status observed among schizophrenics (in %)**

<table>
<thead>
<tr>
<th></th>
<th>Illiterate</th>
<th>Primary level</th>
<th>High School</th>
<th>Higher Secondary</th>
<th>Under Graduate</th>
<th>Graduate &amp; above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>14.4</td>
<td>13.1</td>
<td>42</td>
<td>15</td>
<td>7</td>
<td>8.5</td>
</tr>
<tr>
<td>Female</td>
<td>35</td>
<td>16.3</td>
<td>22.5</td>
<td>17.3</td>
<td>5.9</td>
<td>3</td>
</tr>
</tbody>
</table>

The above table shows that a greater percentage of schizophrenics belong to the lower educational level. Infact, the group that comes to the GMCH for treatment mostly belongs to the lower socio economic strata and are therefore usually illiterate or cannot afford higher education. In the follow-up study conducted in collaboration with the privately practicing psychiatrists, it has been found that most of the patients, both male and female, are highly educated being graduates and also post graduates. Some were engineers and some doctors – all working and earning. Infact, the occurrence of schizophrenia has been noticed in some very intelligent and brilliant individuals also. Hence, educational qualification cannot be considered as a determining factor for the incidence of schizophrenia.
7.4.8 Symptoms at onset

Study was done on the occurrence of symptoms at the time of diagnosis by considering all the 997 cases studied from the data collected from the GMCH and from the follow-up study. The results are as shown in the following table:

Table 7.8: Occurrence of symptoms at onset

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Symptom Type</th>
<th>Type</th>
<th>No. of cases present</th>
<th>No. of cases absent</th>
<th>% of presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Delusions</td>
<td>A</td>
<td>986</td>
<td>11</td>
<td>98.9</td>
</tr>
<tr>
<td>2</td>
<td>Hallucinations</td>
<td>A</td>
<td>898</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>Suspiciousness</td>
<td>A</td>
<td>859</td>
<td>70</td>
<td>86.2</td>
</tr>
<tr>
<td>4</td>
<td>Fearfulness</td>
<td>A</td>
<td>778</td>
<td>219</td>
<td>78</td>
</tr>
<tr>
<td>5</td>
<td>Deterioration of role functioning</td>
<td>B</td>
<td>997</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>Depression</td>
<td>B</td>
<td>249</td>
<td>748</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>Irrelevant speech</td>
<td>B</td>
<td>826</td>
<td>171</td>
<td>82.8</td>
</tr>
<tr>
<td>8</td>
<td>Withdrawn / Pre-occupied</td>
<td>B</td>
<td>572</td>
<td>425</td>
<td>57.4</td>
</tr>
<tr>
<td>9</td>
<td>Excitement</td>
<td>B</td>
<td>720</td>
<td>277</td>
<td>72.2</td>
</tr>
<tr>
<td>10</td>
<td>Aggression</td>
<td>B</td>
<td>768</td>
<td>229</td>
<td>77</td>
</tr>
<tr>
<td>11</td>
<td>Laughing/crying, muttering to self (odd behaviour)</td>
<td>B</td>
<td>810</td>
<td>187</td>
<td>81.2</td>
</tr>
<tr>
<td>12</td>
<td>Abnormal bodily movements</td>
<td>B</td>
<td>399</td>
<td>598</td>
<td>40</td>
</tr>
<tr>
<td>13</td>
<td>Sleep disturbance</td>
<td>C</td>
<td>981</td>
<td>16</td>
<td>98.4</td>
</tr>
<tr>
<td>14</td>
<td>Irritability</td>
<td>C</td>
<td>791</td>
<td>206</td>
<td>79.3</td>
</tr>
<tr>
<td>15</td>
<td>Over religiousness</td>
<td>C</td>
<td>201</td>
<td>796</td>
<td>20.2</td>
</tr>
<tr>
<td>16</td>
<td>Wandersome attitude</td>
<td>C</td>
<td>459</td>
<td>538</td>
<td>46</td>
</tr>
<tr>
<td>17</td>
<td>Lack of personal hygiene</td>
<td>C</td>
<td>760</td>
<td>237</td>
<td>76.2</td>
</tr>
<tr>
<td>18</td>
<td>Disinhibited behaviour</td>
<td>C</td>
<td>245</td>
<td>752</td>
<td>24.6</td>
</tr>
</tbody>
</table>
Observations from Table 7.8

It is seen that the Type A symptoms viz., delusions, hallucinations and suspiciousness have very high occurrence rates at the time of diagnosis. However, the most prevalent symptom is found to be the Type B symptom 'deterioration of role functioning' with a score of 100%. Other type B symptoms like irrelevant speech, laughing and muttering to self or crying for no apparent reason (odd behaviour) and aggression also record very high occurrence rates. Of the Type C symptoms, sleep disturbance ranks highest with a score of 98.4% followed by irritability (79.3%). In fact, some form of delusion, sleep disturbance and a deterioration in role functioning has been observed in the records of more or less all the patients studied. As mentioned in Chapter 2, there are several forms of delusions and the occurrence of any one or more forms at onset is common in schizophrenia. Suspiciousness, though considered separately, is also a variant of delusion and very commonly observed in schizophrenics. The higher occurrence rates of some symptoms may be because the occurrences of at least some of these symptoms are interdependent. As for example, 'deterioration of role functioning' is dependent on the presence of delusions and hallucinations and this has been supported by literature. Irrelevancy of speech, irritability, demonstration of bizarre behaviour and sleep disturbance can also be considered to be consequences of delusions and hallucinations.

The above observations are in line with the results of some other more sophisticated and technically superior studies conducted in different parts of the world. The results of Table 7.8 have been presented diagrammatically in Fig 7.4
Fig 7.4 Occurrence of various symptoms in Schizophrenia at the time of diagnosis
7.5 Observations made from the three month follow-up study

As seen from the sample questionnaire given in Annexure 3, the 200 patients of schizophrenia who were followed up for a period of three months were observed for their initial symptom manifestations and their gradual remission / exacerbation. The intensity or condition of the disease has been studied by giving grades to the occurrence of symptoms as severe (3), moderate (2), mild (1) and absent (0). The following observations can be made from the study.

7.5.1 Regularity

The three month follow-up study consisted of 6 revisits to the doctor after initial diagnosis at epoch 0. The pre assigned appointments were fixed on the 7th day, 14th day, 21st day, 28th day, 8th week and finally at the end of the 12th week. The patients were informed that they would be observed for a period of three months. It has been found that even under this follow-up study, all patients were not present in all the appointments. Out of the 200 patients, only 132 turned up in all the pre assigned appointments; the remaining 68 were irregularly present.

The association between regularity in the treatment process and the recovery from illness has been reported extensively in literature. We have made a small attempt to examine this association in our data by applying Chi-square test for independence of attributes. The two attributes under consideration are
(i) Regularity which has two classes viz., regular and irregular

(ii) Response with four classes viz., non response, moderate response, partial remission and complete remission.

The criteria of the above classification are as follows:

- A patient who is present in all the appointments will fall in the class termed "regular".
- A patient who is absent in at least one appointment will fall in the class termed "irregular".
- If the severity grades mentioned above remains unchanged from the time of diagnosis till the last visit for all the symptoms, then the patient will fall under "non-response".
- If the severity grades decrease for at least some symptoms at the end of the study, then the patient will fall under "moderate response".
- If only symptoms of Type C remain present at the end of the study, then the patient will fall under "partial remission".
- If all the symptoms disappear at the end of 12 weeks, then the patient will fall under "complete remission".

The null hypothesis to be tested is

\[ H_0 : \text{Response is independent of regularity} \]

Against the alternative hypothesis

\[ H_1 : \text{Response is not independent of regularity} \] --- (7.1)
In order to test $H_0$, we apply Chi-square test for independence of attributes. The test statistic is given by

$$\chi^2 = \sum_{i=1}^{k} \left( \frac{O_i - E_i}{E_i} \right)^2$$

with $(4-1)(2-1) = 3$ d.f. \hspace{1cm} (7.2)

From the follow-up study, we have the following data in accordance with the above criteria. These data are the observed data ($O$)

<table>
<thead>
<tr>
<th>Response Regularity</th>
<th>Non response</th>
<th>Moderate response</th>
<th>Partial remission</th>
<th>Complete remission</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular</td>
<td>0</td>
<td>39</td>
<td>48</td>
<td>45</td>
<td>132</td>
</tr>
<tr>
<td>Irregular</td>
<td>22</td>
<td>40</td>
<td>5</td>
<td>1</td>
<td>68</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>79</td>
<td>53</td>
<td>46</td>
<td>200</td>
</tr>
</tbody>
</table>

Thus, we have a $4 \times 2$ contingency table. The table of expected values ($E$) corresponding to the above values is given below:

<table>
<thead>
<tr>
<th>Response Regularity</th>
<th>Non response</th>
<th>Moderate response</th>
<th>Partial remission</th>
<th>Complete remission</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular</td>
<td>14</td>
<td>52</td>
<td>35</td>
<td>31</td>
<td>132</td>
</tr>
<tr>
<td>Irregular</td>
<td>8</td>
<td>27</td>
<td>18</td>
<td>15</td>
<td>68</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>79</td>
<td>53</td>
<td>46</td>
<td>200</td>
</tr>
</tbody>
</table>

Since two of the cell values are less than 5, we resort to pooling of the data which makes the degrees of freedom equal to $(4-1)(2-1)-2 = 1$
Using the above values of $O$ and $E$, the value of the statistic $\chi^2$ as given in (7.2) has been found to be 75.046 i.e., $\chi^2(\text{calculated}) = 75.046 \quad \text{(7.3)}$

We have the tabulated value of $\chi^2$ with 1 d.f. at 1% level of significance = 6.635

$\therefore \chi^2 (\text{tabulated}) < \chi^2 (\text{calculated})$

$\therefore$ The calculated value of chi-square is significant at 1% level of significance.

Hence, we have reason to reject the null hypothesis at 1% probability level and can thus infer that the response shown by a patient is dependent on the regularity maintained in the treatment process.

### 7.5.2 Study of transitions between states of severity of symptoms

Considering the high prevalence of symptoms like delusions, hallucinations and deterioration of role functioning as seen from the study on occurrence of symptoms at onset, an endeavour has been made to observe the behaviour of these symptoms or rather, the progression of these symptoms during the three month study course, by applying the concept of Markov chains as conceptualized in Chapter 4. According to medical practitioners, a minimum period of three months is considered essential to come up to some decision on the response of a patient of schizophrenia.

Here, a period of 3 months (12 weeks) is considered as one unit of time, i.e., one transition refers to the transition made at the end of 3 months.
On the basis of the classification done by the doctors on medical discretion, the status score of a symptom is defined as follows:

- 3 → severe state
- 2 → moderate state
- 1 → mild state
- 0 → absent state

Let \( X_n = i \) be the status score of a symptom at the \( n^{th} \) visit or \( n^{th} \) transition,

\[ n = 1, 2, \ldots \]

\( \{ X_n, n \geq 1 \} \) is a Markov chain with state space \( \mathcal{S} = \{ 3, 2, 1, 0 \} \) and transition probability matrix (t.p.m.) \( P = (p_{ij}), \quad i, j = 3, 2, 1, 0. \)

with initial distribution \( p_i = P(X_0 = i) \)

As mentioned in Chapter 6, the M.L.E of \( p_{ij} \) can be obtained using Anderson and Goodman (1957) as follows:

\[
\hat{p}_{ij} = \frac{n_{ij}}{n_i} \quad \text{------(7.6)}
\]

where \( p_{ij} = \text{probability of going from state } i \text{ to state } j \)
\( n_{ij} = \text{number of patients going from state } i \text{ to state } j \)
\( n_i = \text{number of patients in state } i \text{ initially.} \)

Also, \( N = \sum n_i = \text{total number of patients considered.} \)

**Testing of hypothesis:** That the defined \( \{ X_n, n \geq 1 \} \) is a Markov chain of order 1 can be verified using the Chi-square statistic as given below.
To test the null hypothesis that the considered Markov chain is of order 0 i.e.,
\[ H_0 : p_{ij} = p_{j} \quad \text{for all } i, j = 3, 2, 1, 0 \]
against the alternative hypothesis that the chain is of order 1, we have the test statistic, given by Anderson and Goodman (1957), as follows
\[
-2 \log \lambda = 2 \sum_{i=3}^{0} \sum_{j=3}^{0} n_{ij} \log \frac{N n_{ij}}{(n_{i0})(n_{0j})}
\]
\[ \text{--------(7.7)} \]
This statistic follows asymptotic \( \chi^2 \) (chi-square) distribution with \((m-1)^2\) d.f. (degrees of freedom). (Here, \( m = 4 \)). It is to be noted that one d.f. is lost for every \( p_{ij} = 0 \), if any.

(a) Transitions between states of severity in case of delusions

Delusion is by far the most prevalent Type A symptom and can be present in various forms. The progression of this symptom in the 200 patients during the 3 month follow-up has been studied separately for regular and irregular patients.

Case I: Case of regular patients

Among the 132 regular patients, it was observed that at the time of diagnosis
- the number of patients in state 3 = 72
- the number of patients in state 2 = 48
- the number of patients in state 1 = 10
- the number of patients in state 0 = 2

At the end of three months, the observed transitions \((n_{ij})\) can be represented in the following two-way table:
Table 7.9: Observed transitions for regular patients in case of delusions

<table>
<thead>
<tr>
<th>Severity state</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4</td>
<td>28</td>
<td>8</td>
<td>32</td>
<td>72</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>4</td>
<td>15</td>
<td>29</td>
<td>48</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>32</td>
<td>27</td>
<td>69</td>
<td>132</td>
</tr>
</tbody>
</table>

Testing of hypothesis: That the above data follows a Markov chain of order 1 can be verified by using the statistic defined in (7.7) which gives

\[-2 \log \lambda = 14.49\]  

\[\text{------(7.8)}\]

Here, d.f. = 9 - 6 = 3.

We have \( \chi^2_{5,0.01} \text{(tabulated)} = 11.341 \). Hence, the calculated value of the statistic is significant at 1% probability level and it can be inferred that the considered data follows a Markov chain of order 1.

From the data, the initial distribution is obtained as follows:

\[P(X_0 = 3) = \frac{72}{132} = 0.55,\]  
\[P(X_0 = 2) = \frac{48}{132} = 0.36,\]

\[P(X_0 = 1) = \frac{10}{132} = 0.075,\]  
\[P(X_0 = 0) = \frac{2}{132} = 0.015\]  

\[\text{------(7.9)}\]

The transition probability matrix for regular patients in case of delusion as defined in (7.5) and (7.6), obtained by using Table 7.9, is given by
Case II: Case of irregular patients:

Among the 68 regular patients, it was observed that at the time of diagnosis

the number of patients in state 3 = 47

the number of patients in state 2 = 12

the number of patients in state 1 = 8

the number of patients in state 0 = 1

At the end of three months, the observed transitions \((n_{ij})\) can be represented in the following two-way table:

Table 7.10: Observed transitions for irregular patients in case of delusions

<table>
<thead>
<tr>
<th>Severity state</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>29</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>47</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>10</td>
<td>2</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>30</td>
<td>7</td>
<td>2</td>
<td>68</td>
</tr>
</tbody>
</table>
Testing of hypothesis: That the above data follows a Markov chain of order 1 can be verified by using the statistic defined in (7.7) which gives

$$-2 \log \lambda = 24.618$$  \hspace{1cm} (7.11)

Here, d.f. = 9 - 8 = 1

We have $\chi^2_{1,0.01}$ (tabulated) = 6.635.

Hence, the calculated value of the statistic is significant at 1% probability level and it can be inferred that the considered data follows a Markov chain of order 1.

From the data, the initial distribution is obtained as follows:

$$P(X_0 = 3) = \frac{47}{68} = 0.69,$$
$$P(X_0 = 2) = \frac{12}{68} = 0.18,$$

$$P(X_0 = 1) = \frac{8}{68} = 0.12,$$
$$P(X_0 = 0) = \frac{1}{68} = 0.01$$  \hspace{1cm} (7.12)

The transition probability matrix for irregular patients in case of delusion as defined in (7.5) and (7.6), obtained by using Table 7.10, is given by

$$
\begin{bmatrix}
3 & 2 & 1 & 0 \\
3 & 0.62 & 0.38 & 0 & 0 \\
2 & 0 & 0.8 & 0.2 & 0 \\
1 & 0 & 0.25 & 0.625 & 0.125 \\
0 & 0 & 0 & 0 & 1
\end{bmatrix}
$$  \hspace{1cm} (7.13)

The results obtained in the two cases can be summarized in the following Table 7.11 and presented diagrammatically in Fig 7.5.
Table 7.11: Transitions between states of severity in delusion

<table>
<thead>
<tr>
<th>Transition from state</th>
<th>Transition probabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regular case</td>
</tr>
<tr>
<td>3 → 3</td>
<td>0.05</td>
</tr>
<tr>
<td>3 → 2</td>
<td>0.4</td>
</tr>
<tr>
<td>3 → 1</td>
<td>0.11</td>
</tr>
<tr>
<td>3 → 0</td>
<td>0.44</td>
</tr>
<tr>
<td>2 → 3</td>
<td>0</td>
</tr>
<tr>
<td>2 → 2</td>
<td>0.08</td>
</tr>
<tr>
<td>2 → 1</td>
<td>0.31</td>
</tr>
<tr>
<td>2 → 0</td>
<td>0.61</td>
</tr>
<tr>
<td>1 → 3</td>
<td>0</td>
</tr>
<tr>
<td>1 → 2</td>
<td>0</td>
</tr>
<tr>
<td>1 → 1</td>
<td>0.4</td>
</tr>
<tr>
<td>1 → 0</td>
<td>0.6</td>
</tr>
<tr>
<td>0 → 0</td>
<td>1</td>
</tr>
</tbody>
</table>

Fig 7.5  Graph showing Transition probabilities in case of Delusions (results of a three month follow-up study)
Observations:

An idea of the difference in response shown by the regular and irregular patients with respect to delusions can be obtained from the above table and the corresponding graph. It has been observed that even for a regular patient, delusions seem to persist though not exacerbate. They do remit as there are instances of complete response from all the states. In case of irregular patients, delusions seem to remain in the same state of severity with greater probability and there have been instances of exacerbation from the mild state to the moderate state. Complete response has been observed only from the mild state. However, for both regular and irregular patients without the symptom at epoch 0, delusions have not appeared during the course of the study.

(b) Transitions between states of severity in case of hallucinations:

The next most important Type A symptom is hallucination. The progression of this symptom during the 3 month follow-up has been similarly studied separately for regular and irregular patients.

Case I: Case of regular patients:

Among the 132 regular patients, it was observed that at the time of diagnosis

- the number of patients in state 3 = 50
- the number of patients in state 2 = 50
- the number of patients in state 1 = 14
- the number of patients in state 0 = 18
At the end of three months, the observed transitions \((n_{ij})\) can be represented in the following two-way table:

**Table 7.12:** Observed transitions for regular patients in case of hallucinations

<table>
<thead>
<tr>
<th>Severity state</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4</td>
<td>7</td>
<td>10</td>
<td>29</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>46</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>7</td>
<td>14</td>
<td>107</td>
<td>132</td>
</tr>
</tbody>
</table>

**Testing of hypothesis:** That the above data follows a Markov chain of order 1 can be verified by using the statistic defined in (7.7) which gives

\[
-2 \log \lambda = 15.92 \tag{7.14}
\]

Here, d.f. = 9 - 8 = 1

We have \(\chi^2_{0.01}\) (tabulated) = 6.635.

Hence, the calculated value of the statistic is significant at 1% probability level and it can be inferred that the considered data follows a Markov chain of order 1.

From the data, the initial distribution is obtained as follows:

\[
P(X_0 = 3) = \frac{50}{132} = 0.38, \quad P(X_0 = 2) = \frac{50}{132} = 0.38, \tag{7.15}
\]

\[
P(X_0 = 1) = \frac{14}{132} = 0.10, \quad P(X_0 = 0) = \frac{18}{132} = 0.14
\]
The transition probability matrix for regular patients in case of hallucinations as defined in (7.5) and (7.6), obtained by using Table 7.12, is given by

\[
\begin{pmatrix}
3 & 2 & 1 & 0 \\
3 & 0.08 & 0.14 & 0.2 & 0.58 \\
2 & 0 & 0 & 0.08 & 0.92 \\
1 & 0 & 0 & 0 & 1 \\
0 & 0 & 0 & 0 & 1
\end{pmatrix}
\]

\[\text{(7.16)}\]

\underline{Case II: Case of irregular patients:}

Among the 68 regular patients, it was observed that at the time of diagnosis

- the number of patients in state 3 = 34
- the number of patients in state 2 = 15
- the number of patients in state 1 = 8
- the number of patients in state 0 = 11

At the end of three months, the observed transitions \((n_{ij})\) can be represented in the following two-way table:

\underline{Table 7.13: Observed transitions for irregular patients in case of hallucinations}

<table>
<thead>
<tr>
<th>Severity state</th>
<th>(3)</th>
<th>(2)</th>
<th>(1)</th>
<th>(0)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3)</td>
<td>11</td>
<td>11</td>
<td>8</td>
<td>4</td>
<td>34</td>
</tr>
<tr>
<td>(2)</td>
<td>0</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>(1)</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>(0)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>18</td>
<td>18</td>
<td>21</td>
<td>68</td>
</tr>
</tbody>
</table>
Testing of hypothesis: That the above data follows a Markov chain of order 1 can be verified by using the statistic defined in (7.7) which gives

\[ -2 \log \lambda = 23.602 \]  

---------(7.17)

Here, d.f. = 9 - 6 = 3

We have \( \chi^2_{3,0.01} \) (tabulated) = 11.345.

Hence, the calculated value of the statistic is significant at 1% probability level and it can be inferred that the considered data follows a Markov chain of order 1.

From the data, the initial distribution is obtained as follows:

\[ P(X_0 = 3) = \frac{34}{68} = 0.5, \quad P(X_0 = 2) = \frac{15}{68} = 0.22, \]

\[ P(X_0 = 1) = \frac{8}{68} = 0.12, \quad P(X_0 = 0) = \frac{11}{68} = 0.16 \]  

---------(7.18)

The transition probability matrix for irregular patients in case of hallucinations as defined in (7.5) and (7.6), obtained by using Table 7.13, is given by

\[
\begin{pmatrix}
3 & 2 & 1 & 0 \\
3 & 0.32 & 0.32 & 0.24 & 0.12 \\
2 & 0 & 0.47 & 0.265 & 0.265 \\
1 & 0 & 0 & 0.75 & 0.25 \\
0 & 0 & 0 & 0 & 1 \\
\end{pmatrix}
\]  

---------(7.19)

The results obtained in the two cases can be summarized in the following Table 7.14 and presented diagrammatically in Fig. 7.6.
### Table 7.14: Transitions between states of severity in hallucination

<table>
<thead>
<tr>
<th>Transition from state</th>
<th>Transition probabilities</th>
<th>Regular case</th>
<th>Irregular case</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 → 3</td>
<td></td>
<td>0.08</td>
<td>0.32</td>
</tr>
<tr>
<td>3 → 2</td>
<td></td>
<td>0.14</td>
<td>0.32</td>
</tr>
<tr>
<td>3 → 1</td>
<td></td>
<td>0.2</td>
<td>0.24</td>
</tr>
<tr>
<td>3 → 0</td>
<td></td>
<td>0.58</td>
<td>0.12</td>
</tr>
<tr>
<td>2 → 3</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 → 2</td>
<td></td>
<td>0</td>
<td>0.47</td>
</tr>
<tr>
<td>2 → 1</td>
<td></td>
<td>0.08</td>
<td>0.265</td>
</tr>
<tr>
<td>2 → 0</td>
<td></td>
<td>0.92</td>
<td>0.265</td>
</tr>
<tr>
<td>1 → 3</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1 → 2</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1 → 1</td>
<td></td>
<td>0</td>
<td>0.75</td>
</tr>
<tr>
<td>1 → 0</td>
<td></td>
<td>1</td>
<td>0.25</td>
</tr>
<tr>
<td>0 → 0</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Fig 7.6** Graph showing Transition probabilities in case of Hallucinations (results of a three month follow-up study)
Observations:
An idea of the difference in response shown by the regular and irregular patients with respect to hallucinations can be obtained from the above table and the corresponding graph. It has been observed that for a regular patient, the rate of remission is much higher than in the case of delusions though there have been cases where the symptom remains in the same state of severity. In case of irregular patients also, there have been no instances of exacerbation from any state. Again, for both regular and irregular patients without the symptom at epoch 0, hallucinations have not appeared during the course of the study.

(c) Transitions between states of severity in case of deterioration of role functioning:
The most highly occurring Type B symptom was observed to be deterioration of role functioning. The progression of this symptom during the 3 month follow-up has been similarly studied separately for regular and irregular patients.

Case I: Case of regular patients:
Among the 132 regular patients, it was observed that at the time of diagnosis

- the number of patients in state 3 = 76
- the number of patients in state 2 = 45
- the number of patients in state 1 = 11
- the number of patients in state 0 = 0
At the end of three months, the observed transitions \((n_{ij})\) can be represented in the following two-way table:

**Table 7.15:** Observed transitions for regular patients in case of deterioration of role functioning

<table>
<thead>
<tr>
<th>Severity state</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>22</td>
<td>17</td>
<td>23</td>
<td>14</td>
<td>76</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>8</td>
<td>22</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>28</td>
<td>49</td>
<td>33</td>
<td>132</td>
</tr>
</tbody>
</table>

**Testing of hypothesis:** That the above data follows a Markov chain of order 1 can be verified by using the statistic defined in (7.7) which gives

\[-2\log \lambda = 13.12 \tag{7.20}\]

Here, \(d.f. = 9 - 6 = 3\)

We have \(\chi^2_{3,0.01}\) (tabulated) = 11.345.

Hence, the calculated value of the statistic is significant at 1% probability level and it can be inferred that the considered data follows a Markov chain of order 1.

From the data, the initial distribution is obtained as follows:

\[
P(X_0 = 3) = \frac{76}{132} = 0.58, \quad P(X_0 = 2) = \frac{45}{132} = 0.34,\]

\[
P(X_0 = 1) = \frac{11}{132} = 0.08, \quad P(X_0 = 0) = \frac{0}{132} = 0 \tag{7.21}\]
The **transition probability matrix** for regular patients in case of deterioration of role functioning, as defined in (7.5) and (7.6), obtained by using Table 7.15, is given by

$$
\begin{pmatrix}
3 & 2 & 1 & 0 \\
0.29 & 0.23 & 0.29 & 0.19 \\
0 & 0.18 & 0.49 & 0.33 \\
0 & 0.272 & 0.364 & 0.364 \\
0 & 0 & 0 & 1 \\
\end{pmatrix}
$$

(7.22)

**Case II: Case of irregular patients:**

Among the 68 regular patients, it was observed that at the time of diagnosis

- the number of patients in state 3 = 58
- the number of patients in state 2 = 6
- the number of patients in state 1 = 4
- the number of patients in state 0 = 0

At the end of three months, the observed transitions \((n_{ij})\) can be represented in the following two-way table:

**Table 7.16:** Observed transitions for irregular patients in case of deterioration of role functioning

<table>
<thead>
<tr>
<th>Severity state</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>33</td>
<td>21</td>
<td>4</td>
<td>0</td>
<td>58</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>25</td>
<td>8</td>
<td>1</td>
<td>68</td>
</tr>
</tbody>
</table>
Testing of hypothesis: That the above data follows a Markov chain of order 1 can be verified by using the statistic defined in (7.6) which gives
\[-2 \log \lambda = 7.87\]  
\[\text{(7.23)}\]

Here, d.f. = 9 - 7 = 2

We have \(\chi^2_{2.05} \text{ (tabulated)} = 5.991\).

Hence, the calculated value of the statistic is significant at 5% probability level and it can be inferred that the considered data follows a Markov chain of order 1.

From the data, the initial distribution is obtained as follows:
\[P(X_0 = 3) = \frac{58}{68} = 0.85, \quad P(X_0 = 2) = \frac{6}{68} = 0.09,\]
\[P(X_0 = 1) = \frac{4}{68} = 0.06, \quad P(X_0 = 0) = \frac{0}{68} = 0\]  
\[\text{(7.24)}\]

The transition probability matrix for irregular patients in case of deterioration of role functioning, as defined in (7.5) and (7.6), obtained by using Table 7.16, is given by
\[
\begin{pmatrix}
3 & 2 & 1 & 0 \\
3 & 0.57 & 0.36 & 0.07 & 0 \\
2 & 0.17 & 0.5 & 0.33 & 0 \\
1 & 0 & 0.25 & 0.5 & 0.25 \\
0 & 0 & 0 & 0 & 1
\end{pmatrix}
\]  
\[\text{(7.25)}\]

The results obtained in the two cases can be summarized in the following Table 7.17 and presented diagrammatically in Fig. 7.7.
Table 7.17: Transitions between states of severity in deterioration of role functioning

<table>
<thead>
<tr>
<th>Transition from state</th>
<th>Transition probabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regular case</td>
</tr>
<tr>
<td>3 -&gt; 3</td>
<td>0.29</td>
</tr>
<tr>
<td>3 -&gt; 2</td>
<td>0.23</td>
</tr>
<tr>
<td>3 -&gt; 1</td>
<td>0.29</td>
</tr>
<tr>
<td>3 -&gt; 0</td>
<td>0.19</td>
</tr>
<tr>
<td>2 -&gt; 3</td>
<td>0</td>
</tr>
<tr>
<td>2 -&gt; 2</td>
<td>0.18</td>
</tr>
<tr>
<td>2 -&gt; 1</td>
<td>0.49</td>
</tr>
<tr>
<td>2 -&gt; 0</td>
<td>0.33</td>
</tr>
<tr>
<td>1 -&gt; 3</td>
<td>0</td>
</tr>
<tr>
<td>1 -&gt; 2</td>
<td>0.272</td>
</tr>
<tr>
<td>1 -&gt; 1</td>
<td>0.364</td>
</tr>
<tr>
<td>1 -&gt; 0</td>
<td>0.364</td>
</tr>
<tr>
<td>0 -&gt; 0</td>
<td>1</td>
</tr>
</tbody>
</table>

Fig 7.7 Graph showing Transition probabilities in case of Deterioration of Role Functioning (results of a three month follow-up study)
Observations

An idea of the difference in response shown by the regular and irregular patients with respect to deterioration of role functioning can be obtained from the above table and the corresponding graph. It has been observed that even for regular patients, deterioration of role functioning seem to persist and even exacerbate. There are instances of complete response from all the states though with comparatively lower probability than those observed in cases of delusions and hallucinations. In case of irregular patients, deterioration of role functioning seems to remain in the same state of severity with greater probability and there have been instances of exacerbation from the mild state to the moderate state and also from the moderate state to the severe state. Complete response has been observed only from the mild state. However, in this study, there have been no cases, neither among the regular nor the irregular patients who have not recorded the presence of deterioration of role functioning at the time of diagnosis.

In a similar manner, the response pattern or behaviour of all the symptoms can be studied.

7.5.3 Evaluation of Persistence Scores of symptoms

The final endeavour in data analysis of the follow-up study has been to evaluate the persistence scores of the common symptoms of schizophrenia as conceptualized in Chapter 4. The computations of the scores have been done by
designing the study as given in the sampling scheme in section 4.5.3 in Chapter 4. As mentioned earlier, the 200 patients were followed up to 6 revisits to the doctor after initial diagnosis. The results obtained are shown in the following table and graph.

**Table 7.18: Persistence scores of symptoms**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Symptom</th>
<th>Persistence Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Delusions</td>
<td>5.96</td>
</tr>
<tr>
<td>2</td>
<td>Hallucinations</td>
<td>4.05</td>
</tr>
<tr>
<td>3</td>
<td>Suspiciousness</td>
<td>4.84</td>
</tr>
<tr>
<td>4</td>
<td>Fearfulness</td>
<td>3.24</td>
</tr>
<tr>
<td>5</td>
<td>Deterioration of role functioning</td>
<td>6.4</td>
</tr>
<tr>
<td>6</td>
<td>Depression</td>
<td>0.8</td>
</tr>
<tr>
<td>7</td>
<td>Irrelevant speech</td>
<td>3.33</td>
</tr>
<tr>
<td>8</td>
<td>Withdrawn / Pre-occupied</td>
<td>1.84</td>
</tr>
<tr>
<td>9</td>
<td>Excitement</td>
<td>2.64</td>
</tr>
<tr>
<td>10</td>
<td>Aggression</td>
<td>2.15</td>
</tr>
<tr>
<td>11</td>
<td>Laughing/crying, muttering to self</td>
<td>1.73</td>
</tr>
<tr>
<td>12</td>
<td>Sleep disturbance</td>
<td>3.84</td>
</tr>
<tr>
<td>13</td>
<td>Irritability</td>
<td>2.96</td>
</tr>
<tr>
<td>14</td>
<td>Lack of personal hygiene</td>
<td>3.24</td>
</tr>
<tr>
<td>15</td>
<td>Over religiousness</td>
<td>0.69</td>
</tr>
<tr>
<td>16</td>
<td>Wandersome attitude</td>
<td>1.33</td>
</tr>
<tr>
<td>17</td>
<td>Disinhibited behaviour</td>
<td>1.87</td>
</tr>
</tbody>
</table>
Observations from Table 7.18

From the above table, it has been observed that the most persistent symptom is Deterioration of role functioning (6.4). It is interesting to note that this symptom has also recorded cent percent occurrence rate as seen in Table 7.8. High persistence scores have also been recorded in case of delusions (5.96), suspiciousness (4.84) and hallucinations (4.05). Relatively persistent were sleep disturbance (3.84), irrelevant speech (3.33), lack of personal hygiene (3.24) and fearfulness (3.24).

Fig 7.8  Persistence Score of Symptoms
7.6 Remark

It is to be mentioned that this is a small scale study carried out to get an idea about the prevalence of schizophrenia and the influence of some of the risk factors like age, sex, genes, education etc. on schizophrenia. An idea on the behaviour of symptoms, manifested in schizophrenia, in the course of treatment in the presence of all other influencing factors has also been presented. The reliability of the present study is limited by the short duration of the study and the small sample size leading to inadequate size of the sub populations obtained on categorization of the patients into different classes. However, the results obtained have been found to be in complete conformity with available literature and also with the erstwhile experiences of the practicing psychiatrists with whose collaboration this study has been conducted.