CHAPTER III

METHODOLOGY

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CHAPTER III

METHODOLOGY

This chapter presents the plan and procedure of the present study which covers description about research method, variables, population and sample, tools, data collection and statistical techniques used.

3.1 RESEARCH METHOD AND VARIABLES

Keeping in view the nature of the study and the hypotheses formulated, descriptive correlational research methodology was adopted. The descriptive research method using the ADHD symptoms checklist was used to know about the prevalence of various sub-types of ADHD among adolescent students of different genders and intelligence levels. As the research also envisaged studying the relationship of gender and intelligence with occurrence of ADHD, the correlational analysis was done with following variables:

- **Dependent variable:** Attention Deficit Hyperactivity Disorder (ADHD) among adolescent students
- **Independent variables:** (i) Gender (ii) Intelligence

A qualitative analysis of the relevant resources explored during the course of study helped in enlisting some of the suggested remedial and supporting techniques for the adolescent students suffering from ADHD disorder with specific implications for educationists.

3.2 POPULATION AND SAMPLE

Population of adolescent students in the present study consists of all the students studying in IX and X standards of Pathankot – a northern city of Punjab state of India situated at the tri-section point of Indian states of Punjab, Himachal Pradesh and Jammu & Kashmir. As the study
demanded thorough involvement of school authorities and teachers, three co-educational schools of Pathankot which extended considerable amount of cooperation and enthusiasm, were randomly selected to sample the population.

3.2.1 Sample Size Considerations

As the dependent variable in the study was a categorical variable (presence or absence of disorder), logistic regression analysis was required to be appropriately used for statistical analysis. Sample size calculation for logistic regression is considered to be a complex problem but based on the work of Peduzzi, Concato, Kemper, Holford and Feinstein (1996), the following formula was used for calculating minimum number of cases to be included in the study.

\[ N = \frac{10k}{p} \]

Where \( N \) is the minimum number of cases to be included; \( p \) is the smallest of the proportions of negative or positive cases in the population and \( k \) is the number of covariates (the number of independent variables).

As the study involved two independent variables namely Gender and Intelligence, the value of \( k \) was taken as 2 for the above calculation. The value of \( N \) for present study thus came out to be in the range of 100 – 200 considering the proportion of the population suffering from the disorder (p) to be of the range of 0.10 to 0.20 (10 to 20%) as reported in sparsely available research studies regarding prevalence rates of ADHD in India (Bhatia et al, 1991, 1999). Considering the dexterity required in the diagnosis of the disorder, a sample of around 500 adolescent students was considered appropriate to be on the safer side. Thus, initially it was planned to involve 500 adolescent students studying in IX and X standards of the selected schools, but as the study required extended
period of time for its conduct (due to lengthy measurement and
diagnostic procedures involved), and also due to exclusion of some
subjects suffering from one or other form of physical or mental
ailments, a total of 449 students comprising of 178 girls and 271 boys
were finally cluster-sampled in the study who were present throughout
the study and about whom suitable data could be gathered from their
teachers, parents/guardians and health care providers.

The details of the schools and the students sampled are given in table
3.1.

Table 3.1: School-wise Sample Details

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the School</th>
<th>No. of adolescent boys</th>
<th>No. of adolescent girls</th>
<th>Total no. of adolescent students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vidya Mandir Public School, Pathankot</td>
<td>47</td>
<td>38</td>
<td>85</td>
</tr>
<tr>
<td>2</td>
<td>Mahavir Public School, Pathankot</td>
<td>42</td>
<td>34</td>
<td>76</td>
</tr>
<tr>
<td>3</td>
<td>Army School, Pathankot</td>
<td>182</td>
<td>106</td>
<td>288</td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td><strong>271</strong></td>
<td><strong>178</strong></td>
<td><strong>449</strong></td>
</tr>
</tbody>
</table>

Table 3.1 shows that total of 449 adolescent students comprising of 271
adolescent boys and 178 adolescent girls from three co-educational
schools of Pathankot were taken as the sample for present study.

3.3 TOOLS USED

To realise the objectives of the present study, the following tools were
used for data collection:

1. Group Test of General Mental Ability in Hindi by Dr. S. Jalota

2. ADHD Rating Scale – IV by DuPaul, Power, Anastopoulos, and
   Reid with bilingual (English – Hindi) adaptation by Researcher
3. Confirmatory diagnostic interviews with teachers, parents/guardians and health care providers of the ADHD susceptible students

3.3.1 Group Test of General Mental Ability

Considering the profile of the students involved in the study belonging to IX and X standards and for whom Hindi language was easier to read and comprehend, a standardised Group Test of General Mental Ability in Hindi developed and revised by Dr. S. Jalota was used to measure the I.Q. of the students (Jalota, 1984). This time bound verbal test of general mental ability contains 100 mixed up items comprising of 10 Similars, 10 Opposites, 20 Classifications, 20 Number Series, 10 Best Answers, 10 Reasoning and 20 Analogies items. The test has proven to be quite useful for the age-range of 12-18 years commonly found in Indian schools especially for the modal age range of 14-15 years for the students belonging to VIII, IX and X standards (Jalota, 1984).

Reliability and Validity of the Test:

The reliability of the test calculated by the finding of correlations between the odd and even halves scored for the tested population is quite high. The correlation coefficients corrected for length with the Spearman-Brown prophecy formula for class IX and X are .932 and .979 respectively which signifies the high reliability of the test for the intended subjects of the study (Jalota, 1984).

The validity of the test has been reported on the basis of factor analysis of the inter-element scores, which gave a pattern of three centroid factors identified as Verbal (V), Numerical (N) and Reasoning I factors. Multiple correlation study among IX and X class students suggest the validity of the test to be of the order of .78 highlighting the fair
distribution in terms of contributions of the specific Verbal, Numerical and Reasoning components, which are inherent to the assessment of general mental ability. The external criterion of school examination marks has also yielded correlations from .537 to .600 (Jalota, 1984).

**Scoring of the items:**

There are 100 questions in this test and the total time of completing them is 20 minutes. The subject is given ‘one’ mark for every correct response and the Mental Age (MA) is calculated from the total score gathered. I.Q. is then calculated by the formula I.Q.=MA/CA x100 where CA is Chronological Age of the student.

3.3.2 ADHD Rating Scale – IV

ADHD Rating Scale – IV (ADHD RS – IV), developed by DuPaul, Power, Anastopoulos and Reid in 1998 and adapted to Indian conditions by the researcher by including Hindi translation of the English items, was used to diagnose the adolescents for ADHD. The English – Hindi bilingual adaptation was deemed necessary to suit the North Indian conditions making the items more explicity understandable to the parents/ guardians and teachers involved in the diagnostic procedure.

The ADHD RS – IV is a norm-referenced checklist that measures the symptoms of ADHD according to the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (APA, 1994). The scale is an 18-item questionnaire that takes approximately 5 minutes to complete. It has a home as well as school version. Each version is completed independently by the parent or teacher, who reports the frequency of the symptoms over the past 6 months on a 4-point Likert scale. Two sub-scales are distinguished on the ADHD Rating Scale-IV, namely – Inattention and Hyperactivity-Impulsivity. The
subscales are empirically derived and conform to the two symptomatic dimensions described in DSM-IV. The primary change made to each DSM-IV symptom on the ADHD RS – IV is to omit the word ‘often’ from the symptomatic description, and instead have respondents rate the frequency of each symptom on a 4-point Likert scale, i.e. ‘never or rarely’, ‘sometimes’, ‘often’, or ‘very often’.

**Linguistic validation process:**

As the study was to be conducted in North Indian conditions, it was considered appropriate to use the English – Hindi bilingual version of the scale to enhance the understanding of its items for the parents/guardians and teachers of adolescents involved in the study. The translation of the items from English to Hindi was done following linguistic validation process to make the translation conceptually equivalent to the original and easily understandable by the people to whom the bilingual scale was to be administered (Hussein & Vostanis, 2008). The translators involved in the linguistic validation process were university/college teachers with sufficient relevant experience and were fluent in both the languages (English as well as Hindi). They had sufficient awareness of cultural issues involved in the psychological problems and disorders. This understanding was essential for appropriate cultural adaption of a tool (Jones, Lee & Phillips, 2001).

There are many different methods for linguistic validation of a tool and ‘Back translation’ method appears to be the most commonly used method of translation (Hussein & Vostanis, 2008). However due to cost and time constraints, an alternative method namely ‘Multiple-forward translation’ was used in the present validation process (Maxwell, 1996). In this method, two or more translators translate the instrument from the original language to the new language, and the versions of the instrument
in the new language are then compared (Hussein & Vostanis, 2008). In the present study, each item of the scale was translated by two translators. The researcher then compared the two and compiled the most suitably translated and culturally accepted items. Once most suitable translations for all the items of ADHD RS – IV were compiled, the researcher mailed the translated instrument to six bilingual experts drawn from the field of education, clinical psychology and languages to rate the appropriateness of the translation on a three point rating scale where the three points correspond to ‘disagree’, ‘needs amendment’ and ‘agree’. Each expert was expected to rate the appropriateness of the translation for its representation of the idea conveyed by the original statement in English and also for its reflection of the cultural equivalence rather than linguistic equivalence (Beck, Bernal & Froman, 2003).

Those items that failed to achieve consensus in translation were amended and rephrased based on unanimous decision of the experts. Proof-reading of the bilingual English-Hindi adaptation of the scale was carried out by two independent consultants who were not part of the original translation process. The researcher compared the suggestions put forward by the independent proof readers and incorporated the results into the revised draft. A review of this revised draft of bilingual English-Hindi adaptation of ADHD Rating Scale- IV (Home as well as School version) was done by a child psychiatrist from Delhi with good command over English as well as Hindi. Suggestions put forward by the reviewer were incorporated in the final bilingual versions of the scale.

**Reliability and Validity of the scale:**

The Home and School Versions of the ADHD Rating Scale-IV both were standardized on different samples of 2000 each. Participants ranged in
age from 4 to 20 years. Normative data based on age and genders are available and the psychometric properties of this instrument are well established (DuPaul et al., 1998). Coefficient alphas were calculated to determine the internal consistency of both the School and the Home versions of the ADHD Rating Scale IV and its sub-scales.

The alpha coefficients for Total score, Inattention sub-scale score and Hyperactivity-Impulsivity sub-scale score for the School version of the scale are found to be .94, .96 and .88 respectively. Test-retest reliability data were obtained for teacher ratings four weeks apart. Pearson product-moment correlation coefficients for total, Inattention and Hyperactivity-Impulsivity scores are .90, .89 and .88 respectively. For the Home version, the alpha coefficients for total, Inattention and Hyperactivity-Impulsivity scores are found to be .92, .86, and .88 respectively. Test-retest reliability was obtained for parents’ ratings four weeks apart. Pearson product-moment correlation coefficients for total, Inattention and Hyperactivity-Impulsivity scores are .85, .78 and .86 respectively. Thus, both versions of the rating scale have high internal consistency and test-retest reliability.

Inter-rater agreement coefficients between parents and teachers were in the moderate range; .41 for Total score, .45 for Inattention and .40 for Hyperactivity-Impulsivity. These relatively low coefficients suggest that the behaviours characteristic of ADHD might be different across the home and school environment.

The subscale scores correlate significantly with questionnaires like Conners Teacher Rating Scale-39 (CTRS-39) and Conners Parent Rating Scale-48 (CPRS-48). Overall the absolute values of Pearson’s product-moment correlation coefficients ranged from .22 to .88, with 28 out of 30 achieving statistical significance. Teacher ratings correlate significantly
with classroom behavioural observations and children’s academic performance. For the home version, the absolute values of obtained validity coefficients ranged from .10 to .81 with 15 out of 18 achieving statistical significance. Parent and teacher ratings discriminate between children representing different ADHD Sub-types. The combination of both parent and teacher ratings is a better predictor of ADHD (DuPaul et al., 1998). Overall, this measure is well validated and frequently used in both clinics and research studies as an important diagnostic tool for ADHD. The authors of this scale outline cut-off scores for the diagnosis and rule-out ADHD, which were used for this study.

**Reliability and Validity of bilingually adapted scale**

The reliability and validity of bilingually adapted scale by the researcher was established with standardisation process involving 100 adolescent students of age group of 13-16 years. The alpha coefficients which determine the internal consistency of School as well as Home version were calculated for Total score, Inattention sub-scale score and Hyperactivity-Impulsivity sub-scale score. For the School version these values were found to be .88, .86 and .90 respectively and for Home version the values were .86, .85 and .83 respectively. Pearson product-moment correlation coefficients, signifying test-retest reliability of School version based on teachers’ ratings three weeks apart for total, Inattention and Hyperactivity-Impulsivity scores, were .89, .88 and .86 respectively. The corresponding values for Home version based on parents’ ratings three weeks apart were .82, .80 and .82 respectively. These values suggest high internal consistency and test-retest reliability of both the versions.

Criterion validity of the adapted scale was established by correlating the subscale scores with the corresponding scores obtained through original
scale. The values of Pearson’s product-moment correlation coefficients for Total score, Inattention sub-scale score and Hyperactivity-Impulsivity sub-scale score for School version were found to be .77, .81 and .80 respectively. The corresponding values for Home version were .82, .76 and .78 respectively suggesting good measure of validity of the adapted scale.

**Scoring of the items:**

Using home version of the scale, parents/ guardians are asked to determine the symptomatic frequency that best describes the child’s behaviour at home over the past six months (in accordance with DSM-IV guidelines). In school version, teachers rate the frequency that best describes the conduct of the student in school over the past six months or since the beginning of the school year on a 4-point Likert scale, which ranges from, ‘never or rarely’ (0), ‘sometimes’ (1), ‘often’ (2) to ‘very often’ (3).

Three scores namely Inattention, Hyperactivity-Impulsivity and a Total score can be obtained. The addition of the odd numbered items provide the raw score for the Inattention subscale, and the addition of the even numbered items provide the raw score for the Hyperactivity-Impulsivity sub-scale and the combination of both the sub-scales provides the total raw score. The total score is the sum of the two sub-scale scores. All the raw scores can be converted into percentile scores by using the appropriate scoring profiles based on the normative data, which have been provided for male and female children and adolescents of 5 to 18 years of age (DuPaul et al., 1998).
3.3.3 Confirmatory Diagnostic interviews with teachers, parents/guardians and health care providers of the ADHD susceptible students

In order to confirm that the students diagnosed with ADHD using ADHD RS – IV conform to all the DSM – IV criteria (given in Appendix D), the researcher conducted face to face interviews with the teachers, parents/guardians and health care providers of these students. These interviews were meant to get the answers to the questions like:

- Whether some symptoms that cause impairment were present before age 7 years?
- Whether some impairment from the symptoms is present in two or more settings (e.g. at school/work and at home)?
- Whether there is a clear evidence of significant impairment in social, school, or work functioning?
- Whether the symptoms happen only during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder? Whether the symptoms are better accounted for by another mental disorder (e.g. Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder)?

3.4 DATA COLLECTION, SCORING & CATEGORISATION

The researcher visited various schools of Pathankot to explore the feasibility of conducting the study. The heads of the schools were approached and the need and importance of the present study was explained to them. Three schools, which expressed the willingness for conducting the study on their students with active involvement of their teachers and other staff, were finally selected for the study purpose.
These co-educational schools also assured to make the physical infrastructure and the various students’ records available for the study purpose.

First of all, the Group Test of General Mental Ability in Hindi by Dr. S. Jalota was administered to the IX and X standard students of the selected schools as per the method described in the corresponding manual. It took around 45 minutes of time to conduct the test for one batch of around 50-60 students. The test was thus conducted on class-section wise nine batches of students. The students were explained the method of answering the various test items of the study with the help of illustrative examples in around first 20 minutes. Then students were then given the stipulated 20 minutes to answer all the 100 test items. The scoring of the answer sheets was done with the help of the scoring stencil-key by the researcher and the total score for each student was calculated. These point scores were converted into estimated Mental Age (MA) scores with the help of norms mentioned in the manual developed by Jalota (1984). After knowing the Chronological Age (CA) of each student, the I.Q. score was calculated using the formula =MA/CA x 100.

For ADHD diagnosis, the researcher met the class teachers of the students and explained them the purpose of the study along with orienting them about their required contribution in the study. The teachers were then asked to rate the various behaviour parameters of their students using ADHD Rating Scale – IV. While selecting the teachers, it was ensured that they know the students at least for last six months. The scale required the teacher to circle the number on a scale of 0 – 3 that best described the school behaviour of his/her student over the past 6 months where 0 = Never or rarely; 1 = Sometimes; 2 = Often; and 3 = Very often. The raw score of a student for ‘Inattention subscale’ was
obtained by adding the circled numbers corresponding to all odd items of
the scale while his/ her raw score for the ‘Hyperactivity-Impulsivity
subscale’ was obtained by adding the circled numbers corresponding to
all even numbered items. The total raw score was obtained by combining
both the sub-scale scores. All the raw scores were converted into
percentile scores by using the appropriate scoring sheets provided along
with the scale which contain the scoring profiles based on the normative
data for boys and girls of different ages. Some precautions as described
by DuPaul et al. (1998) were taken while converting raw scores into
percentile scores. In those cases where the total score for Inattention
(IA), Hyperactivity-Impulsivity (HI), or Cumulative Total lied between
two other listed scores in scoring sheet, the percentile corresponding to
lower score was chosen as the relevant percentile score. In case of raw
score being repeatedly listed on the HI or IA sections of the scoring
sheet, the highest percentile score corresponding to that raw score was
considered as final. Whenever the score was found to be repeatedly listed
in the Total Section, the lowest percentile score corresponding to that
raw score was considered as final. For the purpose of the study, a student
was required to have received teacher ratings on the ADHD RS – IV at
or above the 90th percentile on any of the ADHD sub-scales to be
identified as a potentially susceptible student to the corresponding
ADHD sub-type.

In the second stage, the parents/ guardians of the students thus identified
were approached through the school authorities. The researcher took
these parents/ guardians into confidence about the purpose of the study
and provided them the home version of ADHD RS – IV to rate the
behaviour of their ward. The raw as well as percentile scores for each
student were calculated as done for school version of ADHD RS – IV.
The cut off score here was also taken at or above 90th percentile for each
sub-scale. The students who met the positive criteria for various sub-types of ADHD through both school as well as home versions of ADHD RS – IV were then selected for the confirmatory diagnosis.

In the end, confirmatory diagnostic interviews were conducted by the researcher with teachers, parents/ guardians and health care providers of the above identified students to confirm whether their ADHD diagnosis conform to all the DSM-IV criteria which include presence of some impairment causing symptoms before the age of 7 years, presence of some impairment from the symptoms in two or more settings, clear evidence of significant impairment in social, school or work functioning, and symptoms not accounting to Pervasive Developmental Disorder, Schizophrenia, Psychotic or any other mental disorder.

Based on these confirmatory diagnostic interviews, the final list of the adolescent students diagnosed with various sub-types of ADHD was prepared. Out of total 271 adolescent boy students, 27, 4 and 6 were diagnosed with ADHD-IT, ADHD-HI and ADHD-CT sub-types respectively. The corresponding numbers for 178 girl students were 9, 1 and 1.

3.5 STATISTICAL TECHNIQUES USED

In order to analyse and understand the data better, the mean I.Q. scores were calculated for boys, girls and total students. The prevalence percentages of each ADHD types were also calculated for different groups. The I.Q. versus ADHD prevalence data for boy as well as girl students was tabulated and graphically plotted using histograms and frequency bars statistics.
As the various hypotheses to be tested involve dichotomous outcome (presence or absence of disorder) predicted by one or more variables, logistic regression analysis was used for statistical analysis.