CHAPTER 2

SURVEY OF RELEVANT LITERATURE

OUTLINE:

2.1 Epidemiological profiles of ADHD
2.2 Research on the sufferings of children with ADHD.
2.3 Studies on the relation between parenting style and ADHD.
2.4 Studies on the relation between parental anxiety and ADHD.
2.5 Studies on the marital quality of parents with children with ADHD.
2.6 Studies on family pathology and its relation to ADHD.
2.7 Studies on well-being of parents of children with ADHD.
2.8 Studies on management of children with ADHD.
2.9 Some important studies conducted in India
2.10 Some most recent important worldwide studies on ADHD.
2.11 Rationale for selection of ADHD clinical group and need for the present research.
2.0 Literature survey is an important step of any research activity. It provides us with information regarding the previous research endeavours undertaken in the present area of interest. The purpose of the review is to (1) conceptualize the world-wide epidemic of ADHD and its consequences; (2) critically examine the treatment options for ADHD; (3) summarize what is known about factors that cause or aggravate ADHD symptoms. This systematic review also identifies gaps in the existing literature that will inform directions for future research.

2.1. Epidemiological profiles of ADHD.

Epidemiological studies help to identify the high risk groups; monitoring the increasing or decreasing trends in incidence thus leads to plan strategies to prevent illness and its management. Many researchers suggest that the prevalence rate of ADHD that has been documented is much lower; a reason could be that the diagnosis of ADHD is complicated by the frequent occurrence of co-morbid conditions (Rowland et al. 2002); delay in seeking treatment or hesitance of some clinicians in diagnosing children in this age group (Anderson et al. 1987).

2.1.1 Worldwide ADHD prevalence rates.

Worldwide studies identify a prevalence rate for ADHD equivalent to 5.29% of children and adolescents (Polanczyk et al. 2007). The male to female ratio for ADHD is about 3:1 (Rowland, 2005). Girls tend to exhibit the inattention symptoms without externalizing behaviours (i.e. Attention Deficit Disorder) (Biederman and Faraone, 2005). Prevalence rates vary somewhat based on the methods chosen to define ADHD, the population studied, and the degree of agreement required between parents, teachers, and/or others in diagnosing ADHD (Barkley, 2006). Following table describes the worldwide prevalence rates of ADHD studied on different children population across countries.
<table>
<thead>
<tr>
<th>COUNTRIES</th>
<th>RESEARCHERS</th>
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<tbody>
<tr>
<td>INDIA</td>
<td>Bhatia et al. (1991)</td>
<td>In India, it was found that the prevalence of ADHD increases with age; the prevalence at the age of 3 to 4 years was 5.2%.</td>
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<td></td>
<td>Malhi and Singhi (2000)</td>
<td>Estimated a prevalence of ADHD 10-20%.</td>
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<td>AFRICA</td>
<td>Bakare, (2012).</td>
<td>The prevalence of ADHD among school children is between 5.4% to 8.7%; the prevalence rate among children from general population is 1.5%.</td>
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<tr>
<td>ARGENTINA</td>
<td>Michanie et al. (2007)</td>
<td>The sample consisted of 300 school age children. The age range was 6 to 12 years. The ADHD prevalence rate found to be 9%.</td>
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<tr>
<td>CHINA</td>
<td>Leung et al. (1996)</td>
<td>A study of hyperactivity in Chinese school boys, reported a prevalence rate of 8.9%.</td>
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<tr>
<td>COLOMBIA</td>
<td>Pineda et al. (1999)</td>
<td>ADHD was found in 18.2% of preschool children.</td>
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<tr>
<td>EGYPT</td>
<td>Aboul-ata &amp; Amin (2015)</td>
<td>The study revealed that the prevalence of ADHD in Fayoum City was 20.5%, with 33.8% among boys and 6.8% among girls.</td>
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<td>ETHIOPIA</td>
<td>Ashenafi et al. (2001)</td>
<td>Prevalence of childhood ADHD from general population in a district in Ethiopia to be 1.5%.</td>
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<tr>
<td>GERMANY</td>
<td>Baumagaertael et al. (1995)</td>
<td>Researchers reported a prevalence of 9.6% at the age of 5 years.</td>
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<td>GREECE</td>
<td>Skounti, et al. (2007)</td>
<td>Studied 1285 children aged 7 years and the ADHD prevalence rate found to be 6.5%.</td>
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<tr>
<td>IRAN</td>
<td>Hebrani et al. (2007)</td>
<td>Prevalence rate was 12.3% in general population of preschool age children of North-East of Iran</td>
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<tr>
<td>ITALY</td>
<td>Mugnaini, et al. (2006)</td>
<td>Studied 1891 children aged 6-7 years and the ADHD prevalence rate found to be 7.1%.</td>
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<tr>
<td>KOREA</td>
<td>Chae et al. (2001)</td>
<td>Estimated a prevalence of ADHD 7.6 – 9.5%.</td>
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<tr>
<td>NIGERIA</td>
<td>Ndukuba et al. (2014)</td>
<td>6.6% of the children met the criteria for diagnosis of ADHD in both home and school settings. There was no significant difference in the gender of the children with ADHD.</td>
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Epidemiological data suggest that the incidence of ADHD has significantly increased over the past two decades (Youssef et al. 2015). It gets more complicated as the expression of ADHD changes with age. Epidemiological studies of ADHD may provide insight for planning the allocation of funds for mental health services (Bird, 2002). Several studies have reported highly variable rates worldwide, ranging from as low as 1% to as high as nearly 20% among school-age children (Faraone et al., 2003). Cross-cultural and cross-informant studies considering environmental factors are essential (Pierrehumbert et al. 2006).

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<tr>
<td>QATAR</td>
<td>Bener et al. (2006)</td>
<td>Studied 1541 children aged 6 - 12 years. 112 boys (14.1%) and 33 girls (4.4%) scored above the cut off for ADHD symptoms, overall prevalence of 9.4%. Children.</td>
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<td>SWITZERLAND</td>
<td>Pierrehumbert et al. (2006)</td>
<td>The study comprised 2,264 children (age: 4.8 to 17.8 years). Results are compared to data from a North American sample. Swiss parents and teachers tend to report more ADHD symptoms than American parents and teachers as far as the oldest groups of children are concerned.</td>
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<td>TEHRAN</td>
<td>Feiz and Emamipour (2013)</td>
<td>1000 children aged 6-7 years; the prevalence rate for attention deficit = 4.1%, hyperactive impulsive = 4.7%, and combined type = 1.7%. The prevalence rate in boys was higher than girl students.</td>
</tr>
<tr>
<td>TURKEY</td>
<td>Zorlu et al. (2015)</td>
<td>1,508 children aged 6 to 14 years. The prevalence rate of ADHD was 8%.</td>
</tr>
<tr>
<td>UNITED ARAB EMIRATE</td>
<td>Valsamma et al. (2009)</td>
<td>The prevalence rate of ADHD was 4.1% as per the parent report and 3.4% as per the teacher report.</td>
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<tr>
<td>UNITED STATES</td>
<td>Hebrani et al. (2007)</td>
<td>Prevalence of ADHD to be 2% to 6%.</td>
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<tr>
<td>VENEZUELA</td>
<td>Montiel-Nava et al. (2002)</td>
<td>1141 students aged 6 to 12 years; 7.19% prevalence in the total population.</td>
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Table 2.1. Representation of worldwide ADHD prevalence rates

Epidemiological data suggest that the incidence of ADHD has significantly increased over the past two decades (Youssef et al. 2015). It gets more complicated as the expression of ADHD changes with age. Epidemiological studies of ADHD may provide insight for planning the allocation of funds for mental health services (Bird, 2002). Several studies have reported highly variable rates worldwide, ranging from as low as 1% to as high as nearly 20% among school-age children (Faraone et al., 2003). Cross-cultural and cross-informant studies considering environmental factors are essential (Pierrehumbert et al. 2006).
2.2. Research on the sufferings of children with ADHD.

2.2.1 Sufferings of children with ADHD in neurocognitive domains:
Children with ADHD poorly performs on measures of executive functioning, vigilance, impaired cognitive flexibility, but usually perform well on verbal or spatial measures (Barkley, 1997). They show deficits in time awareness and its management; slower processing speed (Willcutt, et al. 2005); trouble coordinating motor skills, slow in moving their eyes toward a target (Mahone et al. 2009) thus need more time to complete their tasks.

2.2.2 ADHD increases risk for language impairment in preschool children.
The delay in language development may be attributed to difficulty with sustained attention to the voice and sounds in the environment (Gupta and Ahmed, 2003). ADHD affects attention, thinking, learning process, and social interaction, which are all needed in language development (Sady et al. 2013).

2.2.3 Sufferings of children with ADHD on academic domains.
Approximately 80% of children with ADHD experience scholastic underperformance and one-third of children with ADHD have specific learning disabilities (Corkum et al. 2010). Adolescents who report a history of higher levels of ADHD symptoms achieve significantly poorer academic outcomes than their ‘non-ADHD’ peers (Birchwood and Daley, 2012).

2.2.4 Peer impairment in children with ADHD.
Hyperactive and impulsive behaviours make children with ADHD highly aversive to peers (Whalen and Henker, 1992). Once labelled “ADHD” by peers, suffer more peer stigmatization; peer neglect and peer rejection (Hoza, 2007).
2.2.5 ADHD - a risk factor for internet addiction and Substance Use Disorders:

Videogaming and abusive drugs both increase striatal dopamine release activating the reward pathway which is found in ADHD (Peters et al 2010). Prolonged hours of internet, gaming reinforces child’s hyper-focused reactivity (Weiss et al. 2011). Adults with ADHD have early onset of cigarette smoking and substance abuse than adults without ADHD (Hovens et al. 1994)

2.2.6 ADHD associated with sleep/arousal problems.

Ball et al (1997) reported that more than 50% of children with ADHD have difficulty falling asleep. Stein (1999) reported that moderate to severe sleep problems occurred at least once a week in nearly 20% of children with ADHD compared to 13.3% of psychiatric controls, and 6.2% of pediatric controls.

2.2.7 ADHD increases risk for Obesity and Physical inactivity in adolescence.

Children with ADHD finds difficulty to accomplish goal-directed physical activities, increase the risk for obesogenic behaviours, such as physical inactivity, binge eating - driving the ADHD symptom–physical inactivity–obesity pathway (Khalife et al. 2014). Again, low physically active play in childhood (Robertson et. al.2013) causes inattention and weight gain over time.

2.2.8 ADHD increases risky sexual behaviours among adolescents and adults.

Females with ADHD used condoms significantly less frequently than male ADHD participants and also less than those without ADHD (Huggins et al. 2015). College students with ADHD report a higher incidence of alcohol-related negative consequences and alcohol use disorders than their non-ADHD peers (Rooney, et al. 2012), which increase their risk for engagement in unsafe sexual behaviour.
2.2.9 ADHD increases risk for criminal offending.

Children with ADHD in preschool have a deficit in self-control function and fail to recognize warnings of punishment and are at risk for delinquency in adolescence (Moffitt, 1990). Developmental model suggests ADHD emerges first, followed by oppositional defiant disorder (Eme, 2013), then by severe conduct disorders which increase risk for criminal conviction in adulthood (Rocque et al. 2011).

2.2.10 ADHD – Persistence in Adulthood.

60% of individuals with childhood ADHD continue to have difficulties in adult life (Weiss et al. 1999). They are at greater risk for longer term negative outcomes, such as lower educational attainment; more likely to be dismissed from employment (Mannuzza et al., 1993). Other problems are caused by lateness, absenteeism, excessive errors, fails to accomplish expected workloads, poor sense of time; trouble to meet deadlines (Riccio et al., 2005); at home, relationship difficulties and break-ups are more common (Harpin, 2005).

Despite its pervasive impairment in significant functional areas of life, awareness of this disorder in our society is still limited. Until and unless the pain and distress are felt it will be difficult to identify the need for further research, to plan and allocate funds for better mental health services to alleviate the sufferings of children with ADHD.

Fig. 2 Summarizing the sufferings associated with ADHD.
2.3 Studies on the relation between parenting style and ADHD.

2.3.1 “Being a supportive parent to a hyperactive child is an extremely difficult task”

Behaviours exhibited by hyperactive children are perceived by parents as annoying and stressful result in poor coping reactions (Mulhern & Passman, 1981). ADHD symptoms make it difficult for the child to conform to parental expectations, thus gets enmeshed in chronic conflictual relationships with their parents (Carr, 1999). Campbell et al. (1978) found a bidirectional interaction between the child’s temperament and parenting behaviour: difficult to ascertain whether negative parenting causes ADHD or ADHD symptoms that caused difficult parenting.

2.3.2 Studies on gender differences in parent management in ADHD.

Mothers become more negative and act in a punitive way as she spend more time with the children and participate in transactions that are more stressful, less rewarding, and has less positive feedback (Barkley, et al. 1990). Children with ADHD perceived their father as power-assertive (Gerdes et al. 2007); less affectionate, more overprotective and authoritarian control (Chang et al. 2012). Dissimilarity of parenting styles leads to higher parenting stress (Harvey, 2000) characterized by feelings of powerlessness and insufficiency (Onatsu-Arvilommi, et al. 1998), which often has negative consequences for children (Webster-Stratton & Hammond, 1988). Father’s participation in child rearing of children with ADHD is essential as more mothers are employed now and the degree to which fathers share the burden of caring is also changing (Arnold et al. 1997). Fathers’ positive engagement can improve father-child interactions and relieve maternal burden caused by ADHD symptoms (Chang and Gau, 2010).
2.3.3 Authoritarian Parenting Style and ADHD.

Parents of children with ADHD are more likely to adopt authoritarian parenting style (Yousefia et al. 2011) that make greater use of negative parenting strategies combined with low levels of emotional support and responsiveness (Khamis, 2006). Responsiveness is a prerequisite for the child's development of self-regulation skills (Winsler, 1998). It referred to the ability of parents to adapt their behaviour to their child’s abilities and needs. Diminished parental responsiveness may be associated with the severity of ADHD symptoms and lowers parenting satisfaction.

2.3.4 Parenting and early attachment formation in ADHD.

Parenting in infancy predicts relationship quality with peers concurrently and longitudinally (Sroufe et al., 1999). Children with ADHD are less securely attached thus they would feel less confident in exploring the world around them and have more problems managing new situations (Koemans et al. 2015). They are found to have a self-awareness deficit (Beitman and Nair, 2005) and more sensitive toward violations of social norms than controls (Friedman et al., 2003).

Fig 3. Representing the consequences of parenting an ADHD child.
2.4 Studies on the relation between parental anxiety and ADHD.

Segenreich et al. (2009) found higher prevalence rates of anxiety and depression in parents of children with ADHD. Parenting an ADHD child is a challenging task; parents often perceive their child’s future as uncontrollable and unpredictable which increases parental anxiety level.

2.4.1 Parental trait anxiety and its influence on parenting behaviours.

Highly anxious individuals are more concerned about future threats to the self, respond with hypervigilance, timidity, and non-assertiveness for fear of confrontations and upsetting others (Spielberger, 1977). These anxious attributes might carry over into parenting behaviours, particularly in situations where parents are forced to confront children who are noncompliant, argumentative, and prone to anger outbursts (Kashdan et al. 2004). Parental anxiety and depression have been firmly established as correlates of child anxiety in children with and without ADHD (Flannery-Schroeder, 2004).

2.4.2 Parental sex differences in the degree of anxiety.

Norvilitis et al. (2002) propose that mothers of ADHD children suffer more social rejection for being associated with a stigmatized person and have high trait anxiety (Soltanifar et al. 2009). Fathers show less anxiety perhaps they may maintain positive parenting self-esteem by avoiding interaction with their children (Hoza et al. 2000) or they may have been less likely than were mothers to report symptoms of anxiety to interviewers (Dierker et al. 1999). However, fathers’ engagement in childcare has increased over time (Pajo, 2012). They spent more quality time in leisure and educational activities and mothers were more engaged in chores such as feeding, bathing, and cleaning (Sayer et al., 2004).
2.4.3 Anxiety in working and nonworking mothers of children with ADHD.

Working mothers reported to have more stress, anxiety, higher levels of guilt for not giving much time to their family than working fathers (Hoffman, 1986); but has better mental health and experience less boredom, as they enjoy social life and leisure time (Rapaport and Rapaport, 1972). Non-working mothers have less pressure in their life and have low state anxiety (Adhikary, 2012); but lacking social life is a major stressor for them (Beck, et al. 1961). Enaami and Hashemi, (2011), found that attention deficit behaviours, withdrawal and anxiety in children of non working mothers were more than children of working mothers. Working mothers have been found to promote more independence in their children and they spend higher quality of time to compensate for the missed hours during the day (Pajo, 2012).

![Diagram](image)

**Fig.4** Hypothetical link between parental anxiety and ADHD symptoms.

2.5 Studies on the marital quality of parents of children with ADHD.

Marital quality is defined as an evaluation of the functioning and success of a marital partnership (Spanier & Cole, 1976). Parents attributing negative spousal interactions to child-related stress may be more likely to remain married and feel satisfied with their marriage than those who attribute to an undesirable quality in their spouse or problem in marriage (Hartley et al. 2011).
2.5.1 ‘Birth of the ADHD child causes gradual decline in marital satisfaction’ – How?

Initially, the ADHD symptoms create confusion in parents to realize that whether such behaviour needs remedial assistance or not. Secondly, symptoms make it difficult to the child to conform to parental expectations resulting in chronic conflictual relationships with their parents (Carr, 1999). Thirdly, the family experience social isolation, as others perceive child’s behaviour as annoying, and stressful. Fourth, parents spend much of their time in disciplining their child; have little private couple time to care for each other. Many researches support the notion of a general decline in marital satisfaction following the birth of the ADHD child (Mohammadi et al. 2012).

2.5.2 Rate of relationship dissolution of parents of ADHD children.

Ten years after childbirth, 28% of parents who did not have a child with ADHD are divorced compared to 49% of parents who did have a child with ADHD, thus, in the latter case there is 75% higher probability of having dissolved their relationship and likelihood of divorce is larger if the child with ADHD is a girl (Hoshwar, et al. 2010; Kvist et al. 2011). Other factors like parents who are less educated, marry younger, and have children early in the marriage are at greater risk of divorce (Ono, 2009). Interestingly, having a child with ADHD may also affect the parents’ relationship positively by bringing the family closer together (Reichman et al., 2008).

2.5.3 Couple’s attachment styles and its influence in marital quality.

Insecure attached couples, such as preoccupied, dismissive, fearful are associated with low levels of marital satisfaction and more prone to conflict (Banse, 2004). Preoccupied attached couples worry too much that partners will leave them (Yahya, 2013). Dismissing attached couples has strong denial of the need for dependency and often appear hyper-independent and self-sufficient (Fisher, 1990). Fearful attachment couples are scared of intimate relationships
Avoidant parents of children with ADHD fail to communicate constructively due to their defensive behaviour, including blocking the interaction, distancing themselves, and trying to resolve their stress alone (Yahya, 2013).

**Fig 5.** Integrating the research findings on marital quality of parents of children with ADHD
2.6 Studies on family pathology and its relation to ADHD.

Family psychopathology implies various risk situations (e.g. dysfunctional family structure, poor family functioning, faulty communication patterns, etc) which have impact in mental health (Tiwari, 2008). In dysfunctional families, members receive less stimulation and of lower quality, thus overall development gets delayed (Ghazarian & Buehler, 2010). Blanchard et al. (2006) reported that families of children with persistent developmental problems, including ADHD, “are struggling in the areas of finances, employment, parent-child relationships, and caregiver burden.” Lee et al. (2003) found that families in which ADHD is present commonly have increased stress, fewer resources, and limited coping skills.

2.6.1 Familial risk factors in children with ADHD

Familial risk factors include both genetic factors in terms of heritability and the psychosocial stressor associated with disturbed family situation (Mitra and Ray, 2013). The psychosocial adversities may result into either maternal stress during antenatal period or poor upbringing of the children during postnatal period. Other environmental risk factors can be divided into prenatal, perinatal and postnatal factors. Psychosocial adversities, such as parental marital discord and family dysfunction leading to neglect and abuse of children may appear as postnatal social risk factor of ADHD (Kim et al. 2009).

2.6.2 Heritability of parental psychopathology.

Parent psychopathology, including parental depression, anxiety, substance abuse and ADHD, has been shown to be related to children's behaviour development (Chronis, et al. 2003). Thapar et al. (1999) proposed that 75% of the etiological contribution to ADHD is genetic. Thus, parents who have children with ADHD often have symptoms of the disorder themselves.
2.6.3 Family patterns of children with ADHD

Kendall and Shelton (2003) proposed four management styles in families with children with ADHD. “The chaotic family” was emotional unhealthy with multiple stressors, little external support, little internal structure, no coping strategies. “The ADHD-controlled family” was influenced by the ADHD symptoms which had become the centralizing component of family life, characterized by powerlessness and hopelessness. “The surviving family” attempted to figure out a way to survive as successfully as possible in spite of the disorder. “The reinvested family” had put their energy back into their lives and regained control of their lives.

2.6.4 Perspectives of sibling living with children diagnosed with ADHD

It is crucial to understand the impact of ADHD on their siblings’ behaviours. Jealousy is often experienced by siblings because of differential parental treatment with respect to the amount of attention given to the ADHD children (Salmeron, 2008). Siblings experience discrepancy with discipline – ADHD child would receive few consequences for bad behaviour when it came to homework and chores. This resulted in anger and frustration for the sibling (King et al. 2016).

![Diagram](image)

**Fig. 6.** Representing the family functioning of children with ADHD.
2.7 Studies on well-being of parents with ADHD.

Subjective well-being (SWB) is defined as the individual’s subjective appraisal of his or her life taken as a whole (Cummins et al. 2014). Well being of parents is closely associated with the stability and quality of their intimate family relationships (McKeown et al. 2003).

2.7.1 ADHD and Well-Being

Buchanan (2011) found students who self-reported ADHD also reported lower perceptions of total well-being. ADHD symptomatology was recognized as a core predictor of poor subjective well-being (Agarwal et al. 2012). On the subscales of well-being that represented purpose in life, mastery of one’s environment, and personal growth, individuals reporting a prior ADHD diagnosis rated themselves significantly lower than their non-ADHD peers (Buchanan, 2011).

2.7.2 Subjective wellbeing of mothers of ADHD children.

Subjective well-being is a subset of behavioural sciences that studies how people judge their own lives (Aghabagheri, 2012). High sensitivity and stress associated with parenting children with behavioural disorders may make mothers vulnerable to losing their parental competence and decrease their happiness (Taheri et al. 2013). Families of children with ADHD cause greater problems to mothers and consequently decrease their sense of competence and self-efficacy (Aghabagheri, 2012).

2.7.3 Parental well-being and coping strategies.

Greater parental wellbeing has been associated with the use of more positive coping strategies (i.e. problem-focused coping and seeking social support) and less negative coping strategies (i.e. wishful thinking, self-blame and avoidance) in relation to stress of taking care of a child with
special needs (Saloviita, et al. 2003). In a study on parents of children with ADHD, more use of positive reframing strategies (e.g. thinking about problems as challenges that might be overcome) was associated with higher role satisfaction for both mothers and fathers (Podolski & Nigg, 2001). Less stress and greater parental wellbeing has been associated with the use of fewer negative coping strategies (Pottie and Ingram, 2008). It had been reported that the more the perceived negative emotional consequences of ADHD for parents are, the more likely they are to use dysfunctional coping strategies and to have reduced wellbeing (Savage, 2011).

**Fig. 7.** Hypothetical link between ADHD and well-being
2.8 Studies on management of children with ADHD.

2.8.1 Studies on interventions of ADHD Children on Medical Paradigm.

Douglas, et al. (1986) found significant medication-related improvements on ADHD children, with improved learning acquisition, increased effort and self-correcting behaviours, in addition to improved behaviour. Stimulant medications can lead to a 60% to 80% reduction in acute ADHD symptoms (Barkley, 2004), and predicts better long-term outcomes. Tricyclic antidepressant is often used as an alternative to stimulant medication in the treatment for ADHD.

2.8.2 Studies on limitations of pharmacological interventions in ADHD management.

Potential limitations of using only medicines in the treatment of ADHD are as follows:

- Almost 42% of children with ADHD don't response to medicines (Barabaz & Barabaz, 2000).
- Medication may increase behavioural problems or adverse effects (Cortese et al. 2013).
- Uncertainty about long-term costs and benefits (Molina et al. 2009).
- Poor adherence (Adler and Nierenberg, 2010).
- Medication does not teach the child cognitive reorganization skills (Pelham & Gnagy, 1999).
- Stimulants can mask the need for treatment of an underlying problem (Cucu-Ciuhan and Vasile, 2010).
- Using only pharmacological interventions ignores working on other treatments.
- Possible side effects, such as insomnia, dysphoric mood, reduced appetite, slowing of growth, along with fears about the dependence potential of the drugs (Gomez and Cole, 1991).
- Possibility of re-emergence of symptoms in the evenings (Biederman, et al. 1989).

2.8.3 Studies on the efficacy of combined interventions.

Pelham (1993) advised that treatment plans for children with ADHD should begin with behavioural management and only when these methods fail, medicines are implemented. He
found that 80% of the children receiving a combined approach were "normalized" compared to only 30% of the children receiving a management system alone. The combined approach also found to reduce the need for high dosages of medication (Carlson, et al. 1992). Pelham et al. (1993) found 78% of males under study improved when medication was added to a behavioural plan, whereas only 41% benefitted from the addition of behavioural approaches when medication was already administered.

2.8.4 Studies on the Behavioural treatment approaches used in ADHD.

Behavioural treatments manipulate environmental antecedents and consequences; allows individualized targeting of behavioural deficits and excesses (Frazier and Merrell, 1997). Behavioural antecedents are identified and then modified or replaced by new, more adaptive ones. Environmental consequences are also manipulated to control behaviour.

2.8.4.1 Studies on the factors influencing Behavioural Treatment effects:

Pelham Jr. (1991) listed the variables that influence the effects of behavioural treatments:

(a) Frequency and type of contingent feedback given the target child.
(b) Type of training given to significant others and the frequency with which they are monitored.
(c) Potency of reinforcers; Nature of punishment contingencies employed.
(d) Degree of classmate involvement in treatment. Settings in which treatment is implemented.
(e) Length and nature of follow-up. Adjunctive interventions.
(f) Compliance with prescribed regimen and severity of child's problems.

2.8.4.2 Studies on the efficacy of behavioural parent training strategies.

Anastopoulos et al. (1993), found that after participation in a behavioural parent training program mothers evidenced post-treatment reductions in stress, increased self-esteem, and self-reported improvements in the overall severity of their child's ADHD symptoms which they
maintained at a two month follow-up. Blakemore, et al. (1993) describe a problem-solving parent training program of ADHD children to manage child’s behaviour on compliance and noncompliance to parental requests. Parents are also given instruction in validating feelings, managing anger, and communicating effectively. Results showed decreased parental stress; improved parents' perception of the child and parental problem-solving skills.

2.8.4.3 Advantages and Disadvantages of Behavioural treatments:

Behavioural intervention techniques are useful in the home setting and during when medicines cannot be used. When used in conjunction with medicines, behavioural interventions allow for lower dosages. They also have effects in a broader coverage of symptoms. Finally, behavioural interventions can be used with children who do not respond well to medication or for whom the use of medicine is contraindicated (Pelham, 1991). Such interventions also have limitations. They are not effective for all children. As ADHD is a chronic disorder, such interventions must be lengthy and intensive, thus require a great deal of time and energy. Hence, to get parents and teachers to consistently implement behavioural methods over a long period of time is difficult. In a joint family, it is difficult to convince all family members regarding the use of behavioural principles. It lacks evidence of long-term effects and generalizability of such interventions.

2.8.5 Multimodal or Macroparadigm Model for Treatment of ADHD.

“Macroparadigm” model of ADHD integrates five ‘microparadigms’ to increase diagnostic accuracy and treatment efficacy (Teeter and Clikeman, 1995).

- A neurobiological paradigm - study brain-behaviour relationship of ADHD.
- The cognitive paradigm - addresses attentional, memory, and reasoning abilities.
- The psychological paradigm refers to the study of emotions and attitudes related to ADHD.
- The behavioural paradigm refers to the study of observable behaviours.
- The social-familial paradigm includes peer, sibling and family relations.
To develop a large intervention program that covers all potential problems would be tedious. A more practical approach is to (a) assess a deficit area, (c) determine potential intervention strategies, and (d) decide which ones to use in which order (Maag and Reid, 1994).

2.8.5.1 Studies on School-based intervention – A component within a multimodal Model.

2.8.5.1.1 Studies on the Proactive/Preventive Treatment Strategies in the Classroom.

Proactive treatment strategies involve change in antecedent events to increase (or decrease) the probability that a specific behaviour will occur (Dupaul and Weyandt, 2006). Few strategies are:

- **Choice-making Interventions**: The child is provided with a menu of potential activities and would be expected to choose and complete one of the tasks listed on the menu during the allotted time period. Dunlap et al. (1994) showed that choice making led to reliable and consistent increases in task engagement and reductions in disruptive behaviours.

- **Peer tutoring**: two students work together on an academic activity with one providing assistance, instruction, and/or feedback to another student (Greenwood, et al. 2002).

- **Computer-Assisted Instruction**: The software utilizes multiple sensory modalities, uses smaller bits of information, provides immediate feedback about response accuracy, and limits the use of nonessential features that may be distracting.

2.8.5.1.2 Studies on the Reactive Treatment Strategies in the Classroom.

Reactive strategies involve a change in environmental conditions following a specific behaviour in order to alter the frequency of that behaviour in future. Few strategies for ADHD are:

- **Use of Reprimands**: Reprimands are more successful when made in a brief, calm and quiet manner, delivered privately, making eye contact with the child and immediately following the initial occurrence of problem behaviour(s) (Pfiffner& O'Leary, 1987).
• **Classroom-based Token Reinforcement Programs:** Daily report card system should involve (a) few number of goals (both academic and behavioural) stated positively; (c) feedback is provided by subject or class period; and (d) parents are included in the process (Pfiffner et al. 2006). Use of such programs increases the levels of on-task behaviour, seatwork productivity, and academic accuracy of children with ADHD (DuPaul, et al. 1992).

• **Self-Management Interventions:** By combining self-monitoring and self-reinforcement ADHD children can be taught to monitor and reinforce their own behaviour while fading the use of an externally based, contingency management program (DuPaul & Stoner, 2003).

**2.8.5.1.3 Studies on the role of School Counsellors on ADHD management.**

Kottman et al. (1995) worked on ‘how school counsellors can help?’ in ADHD management:

• School counsellors can offer in-service programs and consultation services to teachers.
• They can help children as well as their parents to enhance medicinal compliance.
• Provide in-service workshops to teachers on how to reduce ADHD symptoms in classroom.
• They can provide educational materials by conducting parenting classes.
• To improve communications and cooperation between the school and the parents.
• They could also help parents explore and coordinate the services available to their children.
• Individual, small or large group counselling and peer facilitator training can also be provided.

**2.8.5.1.4 Studies on the role of classroom accommodations for ADHD management.**

Many children with ADHD benefit from accommodations that reduce distractions in the classroom environment and help them to stay on task and learn (Barkley 2008). Some useful accommodations are as follows:

• Ask the child to seat near the teacher or near a student role model; low distraction work areas.
• Teach the child to use a pointer to help visually track written words on a page.
• Set a timer in front of the classroom. Interim prompts can be used to complete the tasks.
• The desk and chair need to be the right size to avoid fidgety.
• Repeat the task instructions frequently throughout a task enhancing performances.
• Computer-based instruction format promote motivation for learning (Bolic et al. 2013).

2.8.5.1.5 Studies on the use of computer technology for students with ADHD.

Computer use by students with ADHD can promote motivation for learning (Jitendra et al. 2008); active responding and attention (Rabiner et al. 2010); prevent off-task behaviour during educational activities; helps to work at their own pace (Shaw and Lewis, 2005). It is also helpful to overcome handwriting difficulties in terms of speed and legibility (Brossard-Racine, et al. 2011). Promoting computer use in educational activities in the classroom for students with ADHD is an emerging issue in occupational therapy.

2.8.5.1.6 Studies on strategies used for training teachers in management of ADHD children.

• Reducing task length, “chunking” tasks, setting short term goals (Pfiffner and Barkley, 1990).
• The use of increased stimulation within the task (e.g. colour, texture, etc.) (Zentall, 1985).
• Teachers who move about more, engage children while teaching, and allow greater participation of them in teaching activity, increase attention to the task at hand (Barkley, 2002).
• Written, displayed rules and timers for setting task in the classroom help more (Barkley, 2002)
• Reinforcing classroom behaviour increases productivity and accuracy and lowers off-task; hyperactive behaviour (Pfiffner et al. 1985). Positive reinforcement with punishment in the form of response cost increases the overall training program efficacy.
2.8.5.2 Studies suggesting effectiveness of physical exercise in ADHD.

Exercise affects similar dopaminergic and noradrenergic pathways that stimulant drug medications target (Archer et al. 2011). Participation in a physical activity program improved muscular capacity, motor skills, level of information processing and behaviour in ADHD children reported by parents and teachers (Verret et al. 2012). Ko et al. (2013) showed that physical exercise in the form of Treadmill running in combination with methylphenidate alleviated the symptomatic hyperactivity and the spatial learning memory deficits in ADHD. The development of resilience, cognitive capacity and emotional control through exercise schedules (Archer et al. 2014) empowers ADHD individuals to a new level of developmental trajectory.

2.8.5.3 Studies on the role of psychoeducational interventions on ADHD management.

Integrating educational components help to reduce misconceptions about ADHD thus affecting overall treatment acceptability (Sciutto, 2015). Simply providing information may not be sufficient; it is effective when followed by discussion with an informed guide (Guzzetti, 2000). Aguiar et al. (2014) showed that teachers after psychoeducational intervention were able to increase their knowledge about ADHD and also to reduce their doubts and uncertainties, despite good baseline knowledge of ADHD. Such training has also been shown to increase acceptability of medication and behaviour management in the classroom (Vereb & DiPerna, 2004).

Psychoeducation is an early intervention program that facilitates intervention planning (Reynolds & Fletcher, 2000). Psychoeducational interventions have several positive outcomes on improving child’s behaviour, parents’ satisfaction, child's knowledge of ADHD, children's opinion of the use of medication and adherence to medical recommendations (Montoya et al. 2011). However, increased insight through psychoeducation may not be entirely positive if it does not supply coping skills and empower the child (Wiggins et al., 1999).
2.8.5.4 Studies on the Social skills training of an ADHD child.

Social skills are acquired through observational learning, practicing and getting feedback. Children with ADHD often miss these observational details. Social challenges of children with ADHD include disturbed relationships with their peers, difficulty making and keeping friends and lack appropriate social behaviour (Pelham and Bender, 1982). In playgroups, children with ADHD showed ten times more negative verbalizations and three times more aggressive behaviours than their peers (Pelham and Bender, 1982). Long-term outcome studies suggest that these problems continue into adolescence and adulthood and impede the social adjustment of adults with AD/HD (Weiss and Hechtman, 1986). In the social skills training group, the therapist targets specific social behaviours, provides verbal instructions, demonstrations and helps children to role-play the target behaviours with one another.

2.8.5.4.1 Studies on the limitations of social skill interventions on ADHD children.

Social skills training program focus primarily on social skills deficits rather than performance deficits (Plumer and Stoner, 2005). The social problems exhibited by children with ADHD are likely the result of performance rather than skill deficits (Barkley, 1997). The traditional social skills training failed to match the social skills interventions to the specific type of social skills problems that a student with ADHD is experiencing (Gresham, 2002). Additionally, typical social skills training programs use a curriculum-based format with instruction occurring in small groups outside the regular classroom; the training often occurs distal from the point of performance. Interventions for children with ADHD are most effective when they occur in naturalistic environments and focus on the performance of a particular behaviour during the place and time where and when the behaviour is performed (Goldstein & Goldstein, 1998).
2.8.5.4.2 Studies on the group counselling intervention to acquire social skills.

Braswell and Bloomquist (1991) recommend group counselling more often than individual counselling for most ADHD children. Group sessions closely approximate real life peer relationship situations; group members can help each other acquire skills and make generalizations (Webb and Myrick, 2003). A study conducted by Webb and Myrick in 2003 to increase school counsellor understanding and to support a 6-week group counselling intervention for ADHD students as part of a multi-treatment approach to help improve the students’ success in school. Small group counselling interventions as part of the treatment is appealing. It can be fun and give students a language of self-help that enables them to be more responsible for their actions and to manage themselves in the school environment.

2.8.5.4.3 Studies on the effects of peer tutoring on ADHD children

DuPaul, et al. (1998) has documented significant positive effects of Classwide Peer Tutoring (CWPT) on the academic performance and peer social relations of elementary students with ADHD. Hoza, et al. (2003) conducted a study with children with ADHD, where they are assigned peer buddies to promote the use of dyadic friendship skills and parent-arranged play or social activities for the dyads. They concluded that children whose parents complied more with the strategy experienced higher quality friendships and teacher ratings of improvement. Plumer and Stoner (2005) examined the effects of CWPT with and without peer coaching on the positive social behaviours of three children with ADHD during school social activities. The results indicated that CWPT alone did not produce generalized effects but when combined with peer coaching, it produced improvement on positive social behaviours across recess and lunch for all three students. Teachers also showed changes in their perceptions of student behaviour.
2.8.5.5 Studies on the use of play and attention enhancement training.

Proper use of play can reduce the current epidemic of ADHD (Panksepp, 2008). Energy expenditure associated with physical plays decreases impulsiveness and hyperactivity at rest of day time (Ray et al. 2008). The first step to increase child’s attention span is to get the child involved in a high interest project such as creative arts or expressive arts (Paxton and Shoemake, 2007). There are several tasks based on empirical evidence that can be included in the attention enhancement package: colouring, grain sorting, clay modelling, mazes, beading and matching (Agarwal and Rao, 1997). Such task requires them to sit and focus for an extended time. The selection of activities should be based on the criteria: (a) to include an extensive variety of play approaches (e.g., sensorimotor, art, fantasy,), (b) to focus on techniques appropriate to child’s age and (c) should be enjoyable, inexpensive, and easy to implement (Hall et al. 2002).

2.8.5.6 Family skills / Parent training intervention for ADHD.

For ADHD direct child-focused therapies have not been successful (Fabiano et al. 2009). Family Skills Training (FST) is structured to first provide psychoeducation about ADHD followed by strategies to improve structure and routines at home, parent facilitation of child-directed interaction, implementation of a positive reinforcement system, positive methods for correction and redirection, and finishing with generalization and behavioural relapse prevention methods (Curtis, 2010). Family Skills Training recommends an intervention that provides integrated child and parent focused strategies within a family milieu (Curtis, 2010). There are different types of family therapy: Mental Research Institute (MRI) brief therapy, strategic family therapy, structural family therapy, cognitive- behavioural family therapy, and functional family therapy (Carr 2000). These types of family therapy can be used to help families learn how to improve the functioning of different subsystems within the family and how to avoid parenting practices, cycles of interactions, and other environmental factors that might exacerbate the problem.
2.8.5.7 Studies on cognitive retraining programme for ADHD management.

Cognitive retraining involves either computer assisted cognitive rehabilitation (CACR) or manualized modules that targets areas of neuropsychological functioning and seeks to directly improve and/or restore cognitive functions utilizing a variety of pen and paper or computerized tests or games requiring cognitive skills such as attention, planning, problem-solving, and/or memory (Velligan et al. 2006). Drawbacks of computerized programs are: task contents are relatively fixed; often incongruent with patient’s need and expensive. Manualized retraining programs overcome these limitations though at the cost of precision. Rajender et al. (2012) provided 36 sessions of manualized cognitive retraining for 18 weeks on ADHD children in India and found to improve both attentional performance and academic efficiency.

2.8.5.8 Studies on mindfulness training within family system for ADHD management.

Oord, et al. (2012) conducted an 8-week study utilizing Mindfulness Training for children aged 8 to 12 with ADHD and Mindful Parenting for their parents. Results indicated that both the children’s symptoms of ADHD, and their parent’s inattention and hyperactivity symptoms were significantly reduced. At follow-up, positive changes were maintained, and parents also reported significant reductions in their level of parenting stress and over-reactive parenting. Bogels et al. (2010) postulated the following benefits of Mindfulness-Based-Parenting-Training (MBPT): (1) reducing parental stress and reactivity; (2) reducing parental preoccupation resulting from parental and/or child psychopathology; (3) improving parental executive functioning in impulsive parents; (4) breaking the cycle of intergenerational transmission of dysfunctional parenting schemas and habits; (5) increasing self-nourishing attention; and (6) improving marital functioning and co-parenting. MBPT is an ideal family-oriented treatment for ADHD with psychological benefits for all family members, whether they have ADHD or not (Keune & Forintos, 2010).
2.8.5.10 Studies on Self-Management Interventions for children with ADHD.

Children with ADHD may find self-regulation to be difficult (Shimabukuro, et al. 1999). There are three forms of behavioural self-regulation: Self-Monitoring, Self-Monitoring plus Reinforcement, and Self-Reinforcement (Eggett, 2013). One of the most important parts of self-regulation is the “conscious appraisal of immediate past behaviour” (Reid et al., 2005).

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>Intervention</th>
<th>Results</th>
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<tbody>
<tr>
<td>Shimabukuro et al. (1999)</td>
<td>3 male students with ADHD</td>
<td>Self-monitoring and self-graphing of academic performance in Math, Written Expression, and Reading Comprehension. On task behaviour was recorded by teacher.</td>
<td>Academic productivity and accuracy increased across the 3 academic areas during self monitoring and self-recording. Teacher rated an increase in on-task behaviour.</td>
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<tr>
<td>Stewart &amp; McLaughlin (1992)</td>
<td>One male 15 year old.</td>
<td>Self-monitoring of on-task behaviour. No medication was reported.</td>
<td>Decrease in off task behaviour. Severity of disruptions also declined per student observer.</td>
</tr>
<tr>
<td>Harris, et al. (2005)</td>
<td>Six 3rd-5th grade students with ADHD</td>
<td>Self-monitoring of attention (SMA) and Self-monitoring of academic performance (SMP) during spelling. All students were taking medication.</td>
<td>On-task behaviour = 55% (Baseline) SMP = 92% SMA = 94% Percent of spelling words written correctly = 19% (Baseline) SMP = 42% SMA = 57%</td>
</tr>
<tr>
<td>Barry &amp; Messer (2003)</td>
<td>Five 12 year old males with ADHD</td>
<td>Behavioural self-management of Academic performance, on-task and disruptive behaviours. All were taking stimulant medications.</td>
<td>Increase in academic performance of work completion and accuracy. Increased on-task behaviour. Decreased disruptive behaviour. Study shows maintenance at 1 month follow-up.</td>
</tr>
<tr>
<td>Bowers, et al. (1985)</td>
<td>Six 8-11yr old males with ADHD</td>
<td>Teacher reinforcement vs. self-reinforcement on attention to task &amp; reading accuracy. No medication reported.</td>
<td>Teacher Reinforcement Attention = 67.2% Accuracy=91.46% Self-Reinforcement Attention=79.23% Accuracy=92.64%</td>
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Table 2.2 Studies on self-management interventions for ADHD children.
2.9 Some important studies conducted in India on Childhood ADHD (Table 2.3).

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<th>AUTHOR</th>
<th>SAMPLE</th>
<th>OBJECTIVES</th>
<th>RESULTS</th>
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<tbody>
<tr>
<td>Hazari et al. (2015)</td>
<td>20 children diagnosed with ADHD and matched control group.</td>
<td>To find the subjective and objective impairments in sleep of children with ADHD.</td>
<td>60% of children with ADHD had at least one sleep problem &amp; 40% have restless legs symptoms as compared to 30% and 15% of controls.</td>
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<tr>
<td>Shetty and Rai (2014)</td>
<td>312 primary school teachers were selected.</td>
<td>The purpose of this study is to assess the awareness and knowledge of ADHD in elementary school teachers and the variables influencing that knowledge.</td>
<td>268 teachers were aware of the term ADHD and their knowledge of ADHD ranged from poor to adequate. 28 (9%) of teachers had prior training. Only 92 (29%) of the teachers had a good understanding of ADHD.</td>
</tr>
<tr>
<td>Venkata and Panicker (2013)</td>
<td>Seven hundred seventy children aged between 6 and 11 years were selected from four schools in Coimbatore district</td>
<td>(i) To identify the prevalence and gender differences of ADHD in primary school children, (iii) To compare the distribution of ADHD among different socioeconomic status.</td>
<td>ADHD prevalence was 11.32%; found to be higher among the males (66.7%) as compared to that of females (33.3%). The prevalence among lower socio-economic group was found to be 16.33% and among middle socio-economic group was 6.84%.</td>
</tr>
<tr>
<td>David (2013)</td>
<td>A group of teachers and students (n=15 each) from the elementary section (Grades 1-5) of schools (n=5); conducted at Bangalore.</td>
<td>To understand teacher perspectives in relation to ADHD behaviours as they present in mainstream elementary classrooms.</td>
<td>ADHD behaviours are attributed by teachers to parent disciplining styles and environmental factors such as over exposure to electronic media. Teachers respond to classroom challenging behaviours using directive and heuristic strategies.</td>
</tr>
<tr>
<td>Rejani et al. (2012)</td>
<td>A sample (N = 40) of children aged 5 - 10 years with a diagnosis of ADHD (on the ICD-10)</td>
<td>Efficacy of multimodal intervention on attention deficit and hyperactivity, behavioural problems in home &amp; school setup, academic achievement and impact of family stress and coping on the treatment outcome.</td>
<td>Multimodal intervention was superior to medical management, parent counselling in reducing ADHD symptoms, behavioural problems at home and school, and in improving academic performance. Parental stress did not predict the outcome of intervention.</td>
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<tr>
<td>Venkatesh et al. (2012)</td>
<td>Of the 251 referrals, 51 (20.3%) children met the inclusion criteria for the diagnosis of ADHD in a South Indian City.</td>
<td>To analyze the clinical profile, socio-demographic, and neuropsychological factors, and co-morbidity in children with ADHD.</td>
<td>Male:Female ratio was 6.3:1; mean age was 5.7 years. Majority of them belonged to middle and lower socio-economic class and were first-born; brought up in nuclear families. Presence of history of delayed speech and language development was commonly seen. Combined type of ADHD was the most common type. At least one co-morbid diagnosis was seen in 86.3% of children, and the most common was learning disability.</td>
</tr>
<tr>
<td>Suvarna and Kamath (2009)</td>
<td>1250 children; 4-6 years age, selected from 40 kindergartens in 6 localities in south west Mumbai.</td>
<td>To determine the prevalence rate of ADHD in preschool age children in kindergartens of south west, Mumbai</td>
<td>One hundred fifty two (12.2%) children were diagnosed to have ADHD.</td>
</tr>
<tr>
<td>Mukhopadhyay et al (2003)</td>
<td>238 children of age ranging between 5-12 years conducted in Kolkata at a pediatric hospital.</td>
<td>To identify ADHD children, to show the prevalence of the disorder in the age group of 5-12 years and to study their socio-demographic variables, associated medical and co-morbid psychological problems.</td>
<td>The prevalence of ADHD was 15.5%, the inattention subtype was predominant. The mean age of boys and girls with ADHD was 8.49 years and 6.82 years. The male to female ratio was 6.4:1. Majority of them were from middle socio-economic status belonging to Hindu families. Oppositional defiant disorder the most prevalent, depression the least prevalent co-morbid problem.</td>
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2.10 Some most recent important worldwide studies on ADHD (Table 2.4)

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<th>RESULTS</th>
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<td>Ahmed et al. (2017)</td>
<td>To explore factors influencing parents’ decisions to adhere and persist with ADHD pharmacotherapy in children.</td>
<td>Focus groups (n = 3) were conducted with 16 parents recruited from metropolitan Sydney.</td>
<td>Parents elected to cease therapy after their children experienced side effects including appetite suppression, weight loss, and sleep disturbances.</td>
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<tr>
<td>Harpin et al. (2016)</td>
<td>To compare the long-term self-esteem &amp; social function outcomes of individuals with untreated and treated ADHD across childhood, adolescence, and adulthood.</td>
<td>Search of 12 databases was performed to Identify peer-reviewed, primary research articles, reporting long-term self-esteem and/or social function outcomes.</td>
<td>Untreated ADHD was associated with poorer long-term self-esteem and social function skills. Treatment for ADHD caused improvement in outcomes.</td>
</tr>
<tr>
<td>Fried et al. (2016)</td>
<td>To examine whether ADHD is an independent contributor to grade retention and failure to complete high school.</td>
<td>Outcome data was from participants in studies at Massachusetts General Hospital (n = 404 ADHD, 349 controls) who underwent psychiatric interview, socioeconomic status measures, and IQ testing.</td>
<td>Participants with ADHD were significantly more likely to repeat a grade; indicating the critical importance of early identification of ADHD to help mitigate adverse educational outcomes.</td>
</tr>
<tr>
<td>Lange et al. (2016)</td>
<td>To study the prevalence of accidents in children and adolescents affected by ADHD and possible connection between the administration of ADHD-specific medication occurrence of accidents.</td>
<td>Participants included children and adolescents representative of the entire German population.</td>
<td>Results showed significantly higher likelihood for ADHD-affected youngsters to be involved in accidents compared to control group but lacking an overall significant influence of medication regarding the occurrence of accidents.</td>
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<td>AUTHOR</td>
<td>OBJECTIVES</td>
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<td>Storebǿ et al. (2016)</td>
<td>The objective of this study is to investigate possible association between insecure attachment and ADHD in children and adults.</td>
<td>Review of literature was performed using the PsycINFO, Medline, and EMBASE databases. Twenty-nine studies were included in the review.</td>
<td>Overall, the studies showed that parental attachment problems and environmental mediating factors were significantly associated with childhood ADHD. Adults with ADHD had a much higher incidence of insecure attachment styles than reported in the general population.</td>
</tr>
<tr>
<td>Vysniauske et al. (2016)</td>
<td>The current study provides a quantitative meta-analysis of the available studies investigating the relationship between exercise and ADHD symptoms.</td>
<td>Studies were identified through Cochrane, PsycInfo, PubMed, Web of Science databases.</td>
<td>Results suggest that exercise has a modest positive impact on ADHD functional outcomes, such as executive functions and motor skills.</td>
</tr>
<tr>
<td>Imiraj et al. (2016)</td>
<td>This study investigated the differential impact of classroom “idle time”—periods when students with and without ADHD are not actively engaged or waiting for a task.</td>
<td>31 children with ADHD (25 boys &amp; 6 girls; aged 6-12 years) and 31 sex- and age-matched typically developing classmates, were observed in their classroom during two school days.</td>
<td>Both groups experienced the same amount of idle time (12% of the time). During idle time, however, levels of hyperactivity and noisiness increased significantly more in children with ADHD than in their classmates ($p &lt; .05$).</td>
</tr>
<tr>
<td>Watts (2016)</td>
<td>This study draws on prior research on the impact of ADHD on adolescent behaviour and social bonding theory to examine the relationship between ADHD symptoms, school factors, and criminal behaviour.</td>
<td>Study utilizes data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), a nationally representative sample of American adolescents.</td>
<td>A retrospective account of ADHD symptomatology during childhood and early adolescence predicts weakened school attachment, lower grades, and higher risks for both out-of-school suspension and crime.</td>
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</table>
2.11 Rationale for selection of ADHD clinical group for the present research.

- Epidemiological data suggest the incidence of ADHD has increased over the past two decades. Increased research might help to enhance the quality of mental health services.
- ADHD is associated with a significant financial and emotional cost and burden to the healthcare system, education services, carers and families and society as a whole.
- ADHD is a multifaceted disorder. Needs to study the unobservable factors that influence both ADHD diagnoses and outcomes.

The few published Indian studies are indicative of the nascent quality of research in the area. Kuruppuarachchi and Wijeratne, (2004) observed that, ADHD was unheard of in developing countries a few decades ago. The low prevalence of child psychiatric disorders in developing countries was attributed to the presence of extended families which acted as a protective factor. Treatment acceptability is also poorer in India than in western countries. Majority of referrals were related to problems in academic performance (Wilcox et al. 2007). Most attributed their child’s difficulties to learning and memory difficulties, emphasized either volitional or non-volitional nature of the condition or blamed themselves or their spouse (David, 2013). There is an absence of Indian research studies available on children who may be experiencing subclinical or mild levels of ADHD. These children are challenged in classroom settings yet are unlikely to receive any formal or consistent intervention. Indian society, considers education to be the primary tool to advance one’s socio-economic status (Desai, 1972). Parents are more likely to respond to academic rather than behavioural concerns their child may have. In India the main focus of research should be on developing integrated model of intervention taking into account cultural complexities and shared belief systems and values that influence how a condition like ADHD is conceptualized and the challenges it presents in terms of designing suitable interventions (David, 2013).