The prevalence of Attention Deficit Hyperactivity Disorder in Iran: A systematic review

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Objectives: Attention-deficit/hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood. Children with ADHD may experience significant functional problems. Our objective was to examine the prevalence of ADHD and its subtypes in Iran.

Methods: Pubmed, ISI web of science, psychinfo, Iranpsych, Iranmedex, Irandoc were searched. Irandoc, Iranmedex and Iranpsych are Iranian databases of which the last one is especially for psychiatry and psychology literature.

Inclusion criteria were: conducting studies by random sampling, using valid instruments to assess ADHD diagnosis or symptoms ,and presenting a prevalence of ADHD or attention deficit and / or hyperactivity symptoms.

Results: after quality assessment, 16 studies were accepted. Their estimation of prevalence was different as different scales were used. Hyperactive type was more prevalent in boys, and inattentive type was more prevalent in girls.

Conclusion: Being aware of the epidemiology of ADHD in Iran helps us to make improvements in planning the allocation of funds for mental health services. Using one instrument in studying the prevalence of ADHD in a population may lead to more precise estimations.

Keywords: *Attention deficit disorder with hyperactivity, Iran, Prevalence, Review*

Attention-deficit/hyperactivity disorder (ADHD) is the most common neurobehavioral disorder in children. ADHD is also among the most prevalent chronic health conditions affecting school-aged children. The core symptoms of ADHD include inattention, hyperactivity, and impulsivity (1, 2). Children with ADHD may experience significant functional problems such as school difficulties, academic underachievement (3), troublesome interpersonal relationships with family members (4, 5) and peers, and low self-esteem. Children with ADHD may continue to show symptoms as they enter adolescence and adulthood (6, 7).

Children with ADHD might have serious social problems not only caused by the disorder, but also due to co morbidity with other disorders, leading to serious social withdrawal. Early diagnostic and treatment of ADHD might improve educational and psychosocial development of these children.

The prevalence rate of attention deficit hyperactivity disorder (ADHD) is a controversial matter. Although the DSM-IV gives an interval of between 3% to 5%, possibly the value most widely accepted by the scientific community, there is in fact a very high degree of variability.

Several literature reviews have reported highly variable rates worldwide, ranging from as low as 1% to as high as nearly 20% among school-age children (8, 9).

There is concern that ADHD/HD may be a product of cultural factors and this has promoted an enduring debate in the medical literature (9-11). Other experts have argued that the variability of ADHD/HD

prevalence estimates may be best explained by the use of different case definitions and that no variability of the actual prevalence across geographical sites should be found when case definitions are the same (4, 9, 12). Some studies have been conducted in our country to determine the prevalence of ADHD in Iran.

Awareness of the epidemiology of ADHD in Iran helps us to plan the allocation of funds for mental health services in a more effective manner. Further knowledge on this issue would be valuable for the development of policies in the education sector.

The main purpose of this study was to conduct a review of literature on the prevalence of ADHD in Iran.

Materials and Method

A systematic review of literature was performed to identify the prevalence of ADHD in Iranian children and adolescents (up to 18 years old) from 1977. Inclusion criteria were: 1) conducting a study by generalizability of the produced data to the population of the same age; 2) using valid instruments to assess ADHD diagnosis or symptoms; and 3) presenting a prevalence of ADHD or attention deficit and / or hyperactivity symptoms.

Electronic search
Pubmed, ISI web of science, psychinfo, Iranpsych, Iranmedex, Irandoc were searched. Irandoc, Iranmedex and Iranpsych are Iranian databases of which the last one is especially for psychiatry and psychology literature.

Key words for search were:Prevalence, rate, Attention deficit, hyperactivity, ADHD, behavioral problems, impulsivity, Iran, Tehran (and names of other cities which have universities), Conners rating scale, Rutter rating scale, Wender Utah rating scale.

Search was performed by specific strategy for each database.

Hand searching
All Iranian psychiatry and psychology journals were reviewed by hand searching to identify published but not indexed articles. All the booklets of Iranian psychiatry, psychology, and epidemiology congress were reviewed in hand searching.

Gray literature
Gray literature review was performed to identify final reports of research projects, desertions, and theses not published. Irandoc and Iranmedex were searched for final reports up to 2003 after that searched by hand searching.

Review procedure
80 (60 in Farsi and 20 in English) papers were screened in electronic and hand search by title and abstract; of which 64 (45 in Farsi and 19 in English) were rejected as they were either unrelated or repeated in some sources.

In the gray literature search, 57 final reports were screened by abstract; of which 50 were rejected or deleted. It should be noted that we deleted some of the reports as some universities refused to give us the full text of the final reports.

Quality assessment
Quality assessment was performed on full texts of 13 papers and 7 final reports which were approved in the last stage. For quality assessment, we used "Quality Assessment Checklist for Prevalence Studies" which assesses sampling, measurement and analysis method of studies: does the study design yield a sample of respondents representative of defined target group, do the survey instruments yield reliable and valid measures of ADHD and other key concepts (also for translated version), and were special features of the sampling design accounted for in the analysis or subgroups prevalence rates reported?

Quality assessment was performed by two persons from the research team. They reviewed each article and report, and if they both approved an article or a report, we accepted the material; but if one of them rejected the material, a third person reviewed it again.

In quality assessment, 10 papers and 5 final reports were accepted. Some papers were excluded due to not reporting the prevalence or lack of randomization in sampling.

Data extraction
Data extraction was performed and then entered in an excel table.

Statistical Analyses
Due to so many heterogeneities in instruments and in the rate of reported prevalence, we did not conduct analysis, and described the results in tables and graphs.

Results
Characteristics of studies included in the analyses are described in Table 1. They have been conducted on the population of primary school-aged children. However, 3 studies have been conducted on preschool-aged children and only one study addressed university students. Both boys and girls participated in all of the studies. The instruments of studies were Conners (teacher and parents), Rutter (teacher and parents), and CSI-4 (teacher and parents) questionnaire. Conners for parents has 48 questions and its cut off point is 15(chronbach's alpha: %91). Conner for teachers has 28 questions and its cut off point is 15(chronbach's alpha: %96). Rutter for teachers has 30 questions and its cut off point is 9.

Reliability of Rutter test by test-retest is %90 and its validity is %76.7(p=0.001). Reliability of CSI-4 for parents is %87 and for teachers is %89 and its cut off is 6. It has facial validity and its sensitivity is %62 with the specificity of %83.It should be noted that Conners, Rutter and CSI-4 calculate ADHD according to their

Table 1. Characteristics of studies included in the analyses

authors	Time of research	age	City of research	scale	prevalence
Arabgol	?	18-32	Tehran	Conners of adults	hyperactive type 7.8%, inattentive type 2.5% , Mixed type3.7%
Hasan Riahi nabi	1382-1383	13-14	Tehran	Conners (teacher form with 28 questions)	Hyperactivity 21.8%, passive inattention 16.5%, hyperactivity index 34%
Abdolah Omidi	1380	12-15	Kashan	Clinical interview DSM-IV criteria	Mixed type 15.5% (boys 18.4%, girls 10.5%), inattentive type (boys 8.8%, girls 3.1%)
Jahanshir Tavakolizadeh	1375	7-12	Gonabad	CSI--4 (parents and teachers)	ADHD 9%(girls 8.1%, boys 9.9%)
Marzieh Moghadam	1380-1381	7-12	Ghorveh	Clinical interview, DSM-IV criteria	%۴.۲hyperactivity disorder8.2%, attention deficit 4.2%
Fayegh Yousefi	1377	7-12	Sanandaj	CSI-4 (teachers) Clinical interview,	According to interview and test: hyperactive type 11%, inattentive type 11%, mixed type5.5% According to test in boys: hyperactive type 18%, inattentive type 21%, mixed type8.8% and in girls: hyperactive type 6.4%, inattentive type 13%, mixed type2.8%.
Mohssen Kooshan	1380	7-12	Sabzevar	Clinical interview with parents	hyperactivity disorder 7.3%
Homeyra Soleyman nejad	1375-1376	7-12	Ilam	Clinical interview, DSM-IV criteria CSI--4 (parents and teachers)	Attention deficit hyperactivity disorder 4 %(boys5.4%, girls2.3%)
Ghazanfar Kashkooli	1379	7-12	Booshehr	Rutter(teachers)	hyperactive type 5.04% (boys 5.32%, girls 4.62%), inattentive type 2.88% (boys 2.66%, girls 3.2%
Akbar Farshidnejad	1380	7-12	Isfahan	Rutter(teachers and parents)and CSI-4	Rutter(hyperactive type 9.5%, inattentive type0.2%), CSI-4 (hyperactive type 7%, inattentive type16.3%, mixed type2.8%)
Mohamad Yadegari	1383-1384	7-12	Zanjan	Conners (teacher form with 38 questions and parent form with 48 questions)	ADHD in teacher's questionnaire 12.2% and in parent's questionnaire 9.1%
?	?	7-11	Shiraz	Swan (teacher form)	hyperactive type 5% ((boys3%, girls2.1%) , inattentive type 5.2% (boys3.1%, girls2.1%) , mixed type8.5% (boys5.8%, girls2.1%)
Mehdi Tehranidoost	1379	7-9	Semnan	Conners (teacher and parent form with 28 Clinical interview, with children and parents DSM-IV criteria questions)	hyperactive type 6% (boys 3.5%, girls 2.5%), inattentive type 3% (boys 1%, girls 2%, Mixed type12% (boys9%, girls3%)
?	1377-1378	6	Tabriz	Rutter(teacher form)	Hyperactive type 4.4%,, Inattentive type 2.5%
Bahreinian	?	4-5	Tehran	Conners	Inattentive type 8.5%, Mixed type19.9%.
Hebrani	?	?	Mashhad	?	? 12.30%

scoring system. What is obtained from these scales is whether the person has ADHD or not.

Figure 1 demonstrates the prevalence of combined type of ADHD in all the studies. Tehran has the most prevalence rate of ADHD , while Sanandaj has the least prevalence. This is expectable due to cultural differences. It can be related to more social stigma and less access to psychiatric consultation in cities like Sanandaj.

Figure 2 shows the prevalence of hyperactive type of ADHD in girls and boys.
Figure 3 shows the prevalence of inattentive type of ADHD in girls and boys.

Discussion

We have conducted a systematic review of studies addressing prevalence rates of ADHD in Iran. Our results should be interpreted with caution because of

the large variability found in all the conducted analyses.

Probably the different prevalence rates across studies could be accounted for by different methodologies (8,13,14).

Methodological features were coded for each study, including sample size, response rate, information source (e.g., parents, teachers, children), and whether diagnosis followed the DSM or not.

According to DSM, it is possible to diagnose a child who shows symptoms in only one dimension. Some impairing symptoms, but not all, must be shown at home and at school. DSM-IV allows diagnosing ADHD alongside co-occurring disorders.

Unfortunately, many of Iranian studies have only used rating scales to diagnose ADHD in the children.

Moreover, different rating scales have been used by such as Conners, Rutter and CSI-4. It appears that when diagnosis occurred based on DSM, the heterogeneity declined.

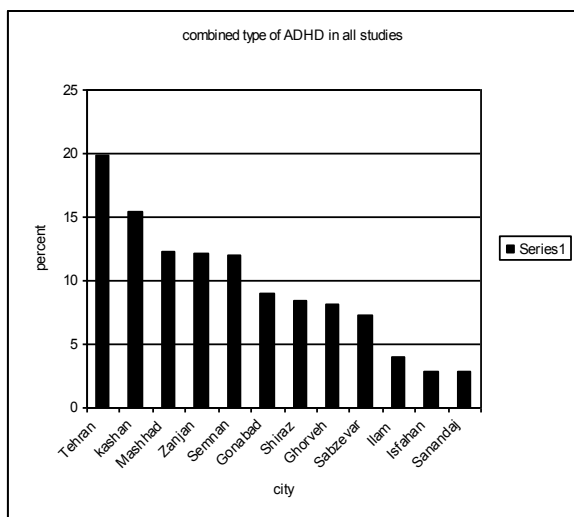Further variations in the apparent prevalence rate arise from differences in the population surveyed.

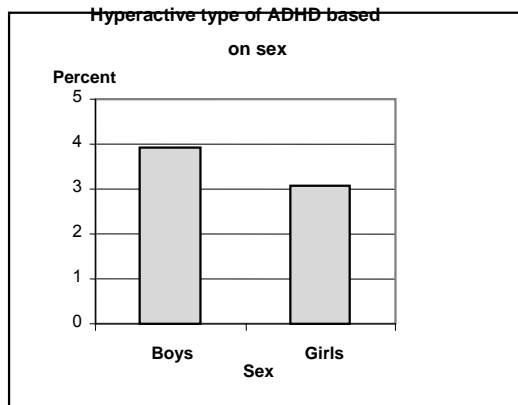**Figure 1. The prevalence of combined type of ADHD in all the studies.**

Figure 2. The prevalence of hyperactive type of ADHD in girls and boys
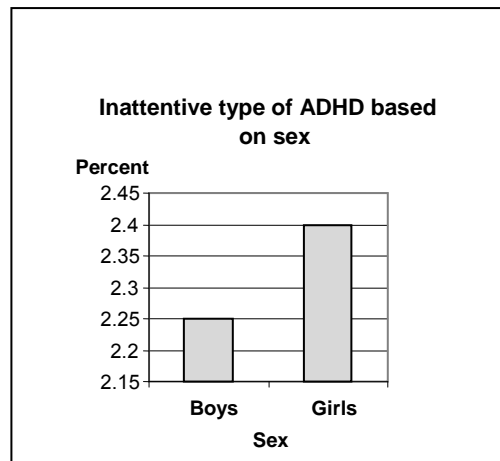

Figure 3. The prevalence of inattentive type of ADHD in girls and boys.

There was not any representative community sample in our studies , and this affects the reported prevalence rate. An analysis of epidemiological studies in the USA found that community samples gave higher prevalence rates than school samples (mean prevalence: 10.3% for community samples vs. 6.9% for school samples) (15, 16).

It is generally agreed that the prevalence of ADHD is significantly higher in boys than in girls, especially in children. Thus, the ratio of males to females in the sample population can affect the apparent prevalence and may need to be taken into account. Similarly, the prevalence of ADHD is known to vary with age. For example, three studies have shown decreases in the prevalence with increasing age over the age range 10-20 years (17), 8-15 years (18), and 6-14 years (19). Thus, even within studies conducted on children, the age range of the sample is likely to affect the apparent prevalence. Most of the studies in our country have been conducted in school-aged children. Although analysis were done in similar age groups, but the heterogeneity did not decrease.

Supporting this conclusion, a multisite trial study reported that using a uniform diagnostic protocol yields ADHD patients who are highly similar across clinics in Africa, Australia, Europe, and North America (20).

It is difficult to make exact comparisons between studies because the estimated prevalence is highly influenced by the means of assessment and the type of sample recruited. It is necessary to take these factors into account when comparing data from different studies.

Limitations

One limitation of the literature we reviewed is the reliance of many studies on rating scale measures rather than interviews with patients and parents. Unlike rating scale methods, interview-based procedures come close to reproduce the results one might expect from a clinical evaluation and are better able to incorporate the impairment and pervasiveness criteria of the DSM diagnoses of ADHD. As discussed by Hartman et al

(21), it is possible that improved operational symptoms could lead to increased measurement precision and a better assessment of the validity of diagnostic categories.

The other limitation was that some studies had reported only the mean score of the indexes. Theses figures could not be accounted because it was not clear how many subjects were above the cutoff point.

Acknowledgment.

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