Review Article

Zahedan Journal of Research in Medical Sciences

Journal homepage: www.zjrms.ir

Meta-analysis of Effectiveness of Methylphenidate on the Rate of ADHD Symptoms

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Article information

Article history:
Received: 1 Nov 2011
Accepted: 16 Nov 2011
Available online: 24 Oct 2012
ZJRMS 2012; 14(10): 1-9

Keywords:
Meta-analysis
Attention-Deficit/ Hyperactivity-Disorder
Drug treatment
Methylphenidateon

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Abstract

***Background*:** In recent years, psychologists and psychiatrists in the field of Attention-Deficit/Hyperactivity-Disorder (ADHD) have been research doing for measurement of validity and efficiency of available treatment and. In this regard, meta-analysis integrates the results of different studies then determines the effect size of drug treatment.This study seeks to investigate the effective rate of methylphenidateon on reducing ADHD symptoms by following the meta-analysis model.

***Materials and Methods*:** 21 Studies which were methodologically accepted were selected and meta-analysis was done on them. The research tool was meta-analysis check list.

***Results*:** the result indicated that rate of effect size drug treatment on reducing ADHD symptoms was 0.71 ($p \leq 0.001$). This rate of effective size according to Cohen table was higher than average and considered.

***Conclusion*:** Therefore, it seems that methylphenidateon can be applied as proper treatments for individuals suffering from ADHD symptoms.

Introduction

One of the most prevalent childhood disorders that attracted the attention of psychologists and psychiatrists is Attention Deficit/ Hyperactivity-Disorder (ADHD). ADHD is in the diagnostic category which is currently used to describe individuals with clinically significant problems with inattention and/or hyperactivity and impulsivity [1]. It is generally acknowledged that Henry Haufman (1845) provided the first clinical description of what is now referred to as ADHD [2].

They act impulsively and do not like to sit down or waiting for their turn, or be quiet. As toddlers, they run away from parents in stores, jump up and down in restaurant booths, and scream in church. In preschool, they run around almost constantly, grab toys, do not listen to teachers, and seem to never tire out. In elementary school, they wander around the classroom, disturb the other students, shout out answers, and so talkative [3].

According to DSM IV-TR, the primary symptoms of ADHD are developmentally inappropriate degrees of inattention, impulsiveness, and hyperactivity. The current criteria allow a child to be diagnosed as either predominantly inattentive, predominantly hyperactive-impulsive, or combined types. Being inconsistent with developmental level, have their onset before the age of 7, be displayed in two or more different settings and be considered clinically significant. According to the DSM IV-TR (APA, 2000), the incidence of ADHD in the general population is in a range of 3 to 7% [4]. ADHD is much more common among males than females [5].

To date no single factor has been identified as the cause of ADHD. ADHD is thought to be the result of complex interactions between genetic, environmental and neurobiological factors [6]. Specifically, it appears that the genetic and environmental etiologies of ADHD lead to the neurobiological differences which are in turn manifest as ADHD symptoms. However, in a few cases ADHD can arise without genetic predisposition. Psychosocial factors do not appear to cause ADHD per se; they clearly have the potential to effect symptom expression [7].

In other words, while they would not appear to cause ADHD, psychosocial factors clearly effect the expressions of this disorder such as head trauma and stroke, to the extent environmental factors have a causal role. It seems likely that they do by interacting with genetic factors. Psychosocial factors seem more likely to effect the symptom expression of ADHD than to be a cause of disorder per se [8]. The attention and impulsivity problems that are hallmarks of ADHD symptoms result in numerous challenges. Common social maladjustment includes behaviors such as aggressiveness, defiance, stubbornness, and verbal hostility towards others.

Common emotional maladjustment includes low frustration tolerance, mood swings, temper tantrums, and anger management challenges [9]. Poor academic performance is among the most prominent features associated with ADHD. Students with ADHD are at greater risk of grade retention, increasing risk of learning disability and lower scores on standardized achievement tests [10]. On the other hand this disorder, effect on

developmental of mental abilities and social-emotional skills, So that the poor academic results delinquency, depression, personality disorders, alcoholism drug abuse, mental dissociation. Occupational problems in these cases were significantly higher than general population [11-13].

Considering this information need for intervention and effectiveness of treatment to improve and reduce disorder and prevention of chronic diseases and make it to probable disorders and reduce the effect of unfavorable interactions in the family. Current effort in treatment of this disorder, are focused on further adjustments of the neural correlates of biochemical and psychosocial [14].

Due to the variety of problems with ADHD, it is certainly possible that one type of treatment alone can`t exist to cover all requirements for treating this disorder. For this reason, practitioners have taken often several treatment strategies combine with each other to each different aspect of child's psychosocial problems would be considered.

Studies have shown that non-drug treatments for this disorder , are generally parent-centered and child-focused psychological interventions [15, 16]. Drug treatment for most children with ADHD, makes up the main part and basic treatment [17, 18]. The most common stimulants used in treatment of ADHD are methylphenidate, dextro amphetamine and amphetamine compounds [19-23].

Medication is recommended just by the experts. The combination of stimulants is extensive used to manage the symptoms of ADHD [24]. For some people, the benefits of such drugs are high significant and for other is average.

Studies in Iran about drug therapy that can be mentioned such as Farmand, Babaei, Tashakori, Alirezaei Motlagh, Moalemi, Esmaeili, Tizdast, Yaghobi, Amiri, Karahmadi, Firozkohi, Moghadam, Faker, Eslami and Imani that the size of drug therapy have reported satisfactory in ADHD [25-38]. Also Zarei and Mohammadi, have reported moderate effect size of pharmacological interventions in reducing symptoms of this disorder [39, 40]. Raul et al. in the meta-analysis study has investigated the effect of Kabamazpyn drug in ADHD and effect size has reported r= 0.88 [41].

Vander-Oord et al. in their meta-analysis of psychosocial treatment, pharmacological and combined are compared and the effect of drug treatment is reported 1.53 that has greater effect according to Cohn table [42]. Kosters et al. in meta-analysis of the effectiveness of methylphenidate in the treatment of adult ADHD, effect size is r= 0.42 that according to Cohen's table is low to medium effect [43].

Meszaros et al. in Meta-analysis of the effectiveness of drug treatment on adults with ADHD, are reported effect sizes r= 0.65 and also believe that drug treatments alone is not sufficient for the treatment that according to Cohen`s table has a large effect [44].

Stephen et al. Compared the efficacy of stimulants for ADHD in children and adolescents by using meta-analysis and concluded that the effect of amphetamines is higher than methylphenidate [45, 46]. Faraone et al. in meta-analysis of the efficacy of methylphenidate for treating adult attention deficit/hyperactivity disorder have been reported the effect size of teachers view r= 0.8 and the parents view r= 0.5 and the methylphenidate in the treatment of this disorder is effective and useful.

According to inconsistent of research results about the effectiveness of methylphenidate in reduction of ADHD symptoms, for example Imani, Karahmadi, Mohammadi and Thashakori each other in their study are reported the effect size (respectively: 0.71, 0.8, 0.85, 0.31) medium to low.

But in research of Faker, Moalemi, Amiri and Tizdast effect of the methylphenidate on reducing ADHD have been reported high (respectively, 6.88, 4.14, 2.98, 4.45). [27, 28, 31, 33, 35, 39, 41].

Therefore, it is necessary to done a meta-analysis in the country to determined effectiveness of the methylphenidate on ADHD symptoms and parents' concerns about medication, It seems that done a meta-analysis would help to clarify the actual effect of the methylphenidate on reduction of ADHD symptoms.

In other words, with done this meta-analysis can be obtain the overall perspective about drug treatment in the country and also one of the goals of meta-analysis is combine with the results of several studies of unit volume size compose this study by using the meta-analysis method which is responded to this question what is the effectiveness of methylphenidate in reduction of ADHD symptoms in Iran?

According to this a considerable part of referrers to psychological and counseling clinics that are ADHD children and also makes care costs for parents, need for this study in the country is clear more than before. Meta-analysis is a statistical technical instead of doing a specific research hypothesis, combined the effect size of the various research.

This method allows the researcher to testing a hypothesis that in various studies have been proposed and examined but have been obtained different and opposite results [47]. According to above subjects, the present study by use of meta-analysis model, has been investigated the rate of influence methylphenidate in reduction of ADHD symptoms (attention deficit, hyperactivity and impulsivity).

Materials and Methods

In this study, according to the goal of study, "meta-analysis" method is used. In meta-analysis, the basic principle is calculate the effect size for individual research (discrete, distinct, segregated) and returning them to a common matrix [48]. Then combining them to achieve average effect. The present meta-analysis with survey of the results of different studies, Together, A general conclusion in efficacy of methylphenidate in drug symptoms of Hyperactivity Disorder-Attention Deficit reached. This meta-analysis was performed exactly according to Cohen's meta-analysis model [47].

Statistical society were theses, research projects and published in scientific journals-research. In the field of drug treatment (drug, methylphenidate) have been conducted in Iran. And have a proper sample size and the

methodology The hypothesis, research methodology, population, sample size and sampling method, measurement instruments, instrument reliability and validity, statistical hypotheses, statistical analysis and statistical calculations to be correct are eligible.

Also during the past several years because the existing research and citing books ADHD have shown that considerable progress has been made in medical therapy and various medications so that research during the past ten years (2000-2010) have been conducted in the country surveys.

In this study, for every 48 source (it is noteworthy that many studies have been conducted in the country on disorder). Therefore, in this study the only purpose of the experimental drug has been used also effects of methylphenidate drug is only intended and other drugs were used in the treatment and due to the unavailability of other sources only 48 studies were selected in the initial check (and among them only 20 were accepted for study) used in the meta-analysis was conducted. And 20 article of the treasure within that criteria have been used. Search resources in research studies conducted in the country to access. The university of MA and Ph.D thesis (researcher to visit the university's library) journals-research in the field of psychology and medicine database resources of the University Jihad (SID), Database Country Review (Magiran), Database Journal of Medical Sciences, Iran (Iranmedex), Documentation Center of Iran (Irandoc) and databases ISI, Elsevier, Sage, Springer Records were used to search for background research.

Keywords were: hyperactivity disorder-attention deficit, medication, methylphenidate, ritalin and the meta-analysis. Persian and Iranian sources also published articles in international english journals were evaluated. Inclusion criteria for this study were: 1- The subject is drug interventions in ADHD. 2- Drug methylphenidate (ritalin) is used. 3- Quality of research methodology is approved. 4- Reliable and accurate means of scales, which have sufficient validity to be used. 5- The drug is used during one to three months. And exclusion criteria of the study were: Researches were not methodological conditions or case study, review, correlation, post hoc research, descriptive statistics and have been non pharmacological. Study quality was assessed by several psychologists and psychiatrist. Based on the scientific validity magazine which this study was published in, it was determined. Detailed list of medical research conducted in the countries in table 1. And researches that had inclusion and exclusion criteria in the meta-analysis research, is shown in table 2. The research of drug methylphenidate (Ritalin) had not used, were excluded (Table 3).

Subject of this research relates to the subject that was research criteria which were used. For selection theses and research papers that have research criteria and extract the necessary information for meta-analysis, the checklist was used. the checklist includes the following components: the studies title about ADHD, full profile performers, study`s perform year, tools, validity and reliability, statistical information, sample size, significance level and methods, however, in all studies used.

Only one type of treatment have not been studied in these conditions, only group`s scores that were related to the drug-treated was used. Also in many studies, different drugs are compared, in this case, only methylphenidate was desired.

Researchers have mean values; variance and standard deviation of the groups are able to calculate the effect size. But the most common indicators are r and d that they almost use d for group differences and r for correlation studies. Thus, according to research list case and refer to them and consider listed criteria, 21 studies were approved (Table 1). To obtain the effect size unused software and size of each research is calculated manually. First, the selection of eligible studies which they were coded based on the time priority, process meta-analysis is to facilitate. Stages meta-analysis`s implementation was basis on meta-analysis`s stages Howitt and Cramer, is as follows: Definition of studies variables, searching databases, assess studies, calculated the effect size for each study, the composition effect size studies, the combination of significant studies, comparison of the effect size of studies with different features. List of articles that methodologically were entry conditions to meta-analysis are listed in table 4. This is the reason for deleting this article, studies that were descriptive, correlational, or are non-medicinal.

Results

In this section based on data presented in report section for each research, the effect size of methylphenidate drug therapy model was calculated. For this purpose, effect size was calculated according to Howit & Cramer. According to current research, the effect size of methylphenidate drug treatment on reduction of ADHD symptoms was reviewed. Table 5 indicates the mean effect size of researches. According to this table, effects of independent variables (drug treatment) on dependent variable symptoms of ADHD was 0.71 that according to the interpretation table Cohen`s effect size, almost can be assessed in high range. Therefore can be noticed that according to the results of this meta-analysis, methylphenidate drug in treatment of ADHD has a relatively large impact.

Discussion

Meta-analysis by integrating the results of different studies that have been implemented on several numerous examples, a more comprehensive view gives the effect of different variables.Indeed through in together the results of a study conducted, on a sample of community different people were examined.

Table 1. Descriptive information pharmaceutical researchs in Iran

Row	Title	Researcher	Resource	*p*-value	Type of drug	Time	Sample size	Type of study	Effect size
1	Effect Fluoxetine on ADHD:a preliminary study	Elham Shirazi(2000)	Scientific Information Database	0.001	Fluoxetine	7weeks	22	Open clinical trail	3.10
2	Compared Effects of methylphenidate in combination with clonidine and effect of Methylphenidate with vitamin B_6 in treatment of ADHD	Seyed farzan Alenabi amlesh(2000)	Tehran University of medical science	0.06	Methylphenidate with Clonidine	4weeks	10	Clinical trail	1.12
3	Compared Effects of methylphenidate in combination with clonidine and effect of Methylphenidate with vitamin B_6 in treatment of ADHD	Seyed farzan Alenabi amlesh(2000)	Tehran University of medical science	0.13	Methylphenidate with placebo	4weeks	10	Clinical trail	0.75
4	Effects of piracetam in The incidence ADHD Children suffering delayed verbal	Javad Akhondian(2001)	Scientific Information Database	0.05	Piracetam with placebo	3weeks	25	Double-blind with placebo	2.58
5	Effects of methylphenidate and And tricyclic antidepressants in the treatment of ADHD	Leila Babaie(2001)	Professional PhD Thesis ,University of Kermanshah	0.05	Methylphenidate		40	A blind clinical trail	2.11
6	Effects of methylphenidate and And tricyclic antidepressants in the treatment of ADHD	Leila Babaie(2001)	Professional PhD Thesis ,University of Kermanshah	0.05	Imipramin, nortriptyline		40	Clinical trail	1.97
7	Effectiveness of behavioral parent training and drug therapy on symptoms of hyperactivity in children with ADHD	Mohamad Zareei(2001)	MA thesis University of Isfahan	0.05	Ritalin	35days	11	Exprimental	1.26
8	Verbal and visual memory in ADHD : Comparing treated and untreated children with Ritalin	Alirezaie motlagh(2002)	Iranian research institute for information science technology (Irandoc)	0.01	Ritalin	3month	12	Exprimental	0.70
9	Verbal and visual memory in ADHD : Comparing treated and untreated children with Ritalin	Alirezaie motlagh(2002)	Advances in Cognitive Science	0.01	Ritalin	3month	12		1.60
10	Verbal and visual memory in ADHD : Comparing treated and untreated children with Ritalin	Alirezaie motlagh(2002)	Advances in Cognitive Science	0.04	Ritalin	3month	12		1.37
11	Comparision the efficacy of reboxetine and ritalin in treatment children with ADHD	Shirin Moalemi(2005)	Professional PhD thesis, Tehran University of medical science	0.0001	Reboxetine	6weeks	18	Open trial	14.04
12	Investigating the efficacy of methyphenidate with or whitout behavior treatment in children with ADHD	Taghi Esmaieli(2005)	Journal of Shahid Beheshti University Medical Sciences	0.01	Methylphenidate	8weeks	20	Clinical trail	1.19
13	Comparison the efficacy behavioral therapy, cognitive-bahavioral therapy ,pharmacological and combined in treatment ADHD	Taher Tizdast(2005)	PhD thesis University of science and research Tehran	0.000	Ritalin		15	Exprimental	4.45
14	Comparison the interactive efficacy neurofeedback and Ritalin in reducing symptoms ADHD	Hamid Yaghubi(2002)	PhD thesis University of social welfare and rehabilitation sciences.	-	Ritalin	10weeks	16	Exprimental with case study	1.17
15	Comparative efficacy venlafaxine and methylphenidate in treatment of ADHD children	Firozkohi(2006)	Tibib Shargh Journal	0.05	Venlafaxine	6weeks	18	Clinical trail	0.82
16	Comparative efficacy venlafaxine and methylphenidate in treatment of ADHD children	Firozkohi(2006)	Tibib Shargh Journal	0.001	Methylphenidate	6weeks	19	Clinical trail	2.02
17	Comparative efficacy of iranian and foreign methylphenidate in children with ADHD	Karahmadi(2007)	Research projects .University of Isfahan	0.0001	Methylphenidate	4weeks	100	Double-blind clinical trail	0.80
18	Six-week treatment with Reboxetin in children and adolescent with ADHD	Arabgol(2007)	Tehran University of medical science journal	0.01	Reboxetin	6weeks	12	Semi-Exprimental	1.89
19	Efficacy of Reboxetin and placebo in treatment of adults with ADHD	Forogh Riyahi(2007)	PhD thesis, Tehran University of medical science	0.05	Reboxetin and placebo	6weeks	34	Double-blind clinical trail	0.85
20	Comparision the efficacy of modafinil and Ritalin in	Shahrokh Amiri(2007)	PhD thesis, Tehran University of medical	0.0001	Modafinil	6weeks	20	Double-blind clinical trail	2.98

	treatment of children and adolescend with ADHD		science						
21	Efficacy of bupropion in in the treatment of children and adolescent with ADHD	Sadrameli(2007)	PhD thesis, IsfahanUniversity of medical science	0.004	Bupropion	4weeks	40	Clinical trail	0.82
22	Comparision the efficacy of ritalin and stimedit in the treatment of ADHD	Faker(2008)	Iran Journal Neurol	0.05	Ritalin	5weeks	16	Double-blind clinical trail	6.88
23	Efficacy of venlafaxine and methylphenidate in the treatment of children ADHD	Firozkohi(2006)	Tibib Shargh Journal	0.001	Methylphenidate	6weeks	19	Clinical trail	2.02
24	Comparision the efficacy of Iranian methyphenidate and foregon in children with ADHD	Karahmadi(2007)	Research projects .University of Isfahan	0.0001	Methylphenidate	4weeks	100	Double-blind clinical trail	0.80
25	Comparing the effects of Jinkotidi and ritalin in the treatment of children and adolescent with ADHD	Reza Imani(2009)	PhD thesis, Tehran University	0.05	Jinkotidi	6weeks	26	Double-blind clinical trail	0.80
26	Selegiline in comparison with methylphenidate in treatment of adults with ADHD	Mohammadi(2009)	Iiranmedex	0.05	Selegiline& methylphenidate	8weeks	40	Double-blind clinical trail	0.85
27	Effect of combination therapy methylphenidate and propranolol and placebo in the treatment of ADHD	Tashakori(2001)	Scientific Information Database	0.001	Methylphenidate	4weeks	30	Double-blind clinical trail	0.60
28	Efficacy of Effectiveness Positive Parenting, drug treatment and Combination therapy in children with ADHD	Farmand(2005)	Iranian research institute for information science technology (Irandoc)	0.05	Methylphenidate		36	Clinical trail	0.31

Table 2. The researches with inclusion criteria to meta-analysis

Row	Title	Tool	Researcher	Method	Duration of use medication	Type of study
1	Compared Effects of methylphenidate in combination with clonidine and effect of Methylphenidate with vitamin B_6 in treatment of ADHD	Conners parent rating scale Conners teacher rating scale	Seyed farzan Alenabi amlesh	Clinical trail	4weeks	Methylphenidate with Clonidine
2	Effects of methylphenidate and And tricyclic antidepressants in the treatment of ADHD	Conners parent rating scale & Diagnostic Interview for children	Leila Babaie	Clinical trail	6weeks	Methylphenidate
3	Effectiveness of behavioral parent training and drug therapy on symptoms of hyperactivity in children with ADHD	Child Symptoms Inventory (CSI-4)	Mohamad Zareei	Exprimental	5weeks	Ritalin
4	Verbal and visual memory in ADHD: Comparing treated and untreated children with Ritalin	Child Symptoms Inventory (CSI-4), Conners rating scale	Alirezaie motlagh	Clinical trail	3month	Ritalin
5	Verbal and visual memory in ADHD: Comparing treated and untreated children with Ritalin	Child Symptoms Inventory (CSI-4), Conners rating scale Interview clinical	Alirezaie motlagh	Clinical trail	3month	Ritalin
6	Comparision the efficacy of reboxetine and ritalin in treatment children with ADHD	Conners parent rating scale	Shirin Moalemi	Open trial	6weeks	Ritalin
7	Investigating the efficacy of methyphenidate with or whitout behavior treatment in children with ADHD	Conners parent rating scale Conners teacher rating scale	Taghi Esmaieli	Clinical trail	8weeks	Methylphenidate
8	Comparison the efficacy behavioral therapy, cognitive-bahavioral therapy ,pharmacological and combined in treatment ADHD	Child Symptoms Inventory (CSI-4) ,Conners rating scale	Taher Tizdast	Exprimental	4weeks	Ritalin
9	Comparison the interactive efficacy neurofeedback and Ritalin in reducing symptoms ADHD	Conners parent rating scale	Hamid Yaghubi	Exprimental with case study	10weeks	Ritalin
10	Comparative efficacy venlafaxine and methylphenidate in treatment of ADHD children	ADHD Rating Scale,Diagnostic interview	Firozkohi	Clinical trail	6weeks	Methylphenidate
11	Comparative efficacy of iranian and foreign methylphenidate in children with ADHD	Conners parent rating scale, Diagnostic interview	Karahmadi	Clinical trail	4weeks	Methylphenidate
12	Comparision the efficacy of modafinil and Ritalin in treatment of children and adolescend with ADHD	Conners parent rating scale	Shahrokh Amiri	Clinical trail	6weeks	Ritalin
13	Comparision the efficacy of ritalin and stimedit in the treatment of ADHD	ADHD Rating Scale	Faker	Clinical trail	5weeks	Ritalin
14	Efficacy of ritalin and stimedit in the treatment of children ADHD	ADHD Rating Scale	Firozkohi	Clinical trail	6weeks	Ritalin
15	Comparision the efficacy of Iranian methyphenidate and foregon in children with ADHD	Conners parent rating scale, Diagnostic interview	Karahmadi	Clinical trail	4weeks	Methylphenidate
16	Comparing the effects of Jinkotidi and	Vanderbit rating scale	Reza Imani	Clinical trail	6weeks	Ritalin

	ritalin in the treatment of children and adolescent with ADHD					
17	Selegiline in comparison with methylphenidate in treatment of adults with ADHD	Conners parent rating scale	mohammadi	Clinical trail	8weeks	Methylphenidate
18	Effect of combination therapy methylphenidate and propranolol and placebo in the treatment of ADHD	Conners parent rating scale, Diagnostic interview	Tashakori	Clinical trail	4weeks	Methylphenidate
19	Efficacy of Effectiveness Positive Parenting, drug treatment and Combination therapy in children with ADHD	ADHD Rating Scale ,Conners parent rating scale	Farmand	Clinical trail	6weeks	Methylphenidate

Table 3. Discriptive data of researches in meta analysis

Researcher	The mean doses of drugs	**tools**	Way of diagnose	Gender	Mean age
Shirazi et al.	20 mg	Conners parent rating scale, Conners teacher rating scale, Children global assessment scale	Diagnostic Statistical Manual of Mental Disorders -4th ed (DSM-IV), Diagnostic interview	Boy & Girl	6-16
Esmaeili et al.	5mg/1kg	ADHD Rating Scale	Diagnostic Statistical Manual of Mental Disorders -4th ed) DSM-IV ADHD rating Scale	Boy & Girl	6-12
Arabgol et al.	4-6mg	ADHD Rating Scale, Diagnostic interview	Diagnostic Statistical Manual of Mental Disorders -4th ed) DSM-IV	Boy & Girl	7-16
Esmaeili et al.	21±7.6 - 21±7.1	Conners parent rating scale Conners teacher rating scale	Diagnostic Statistical Manual of Mental Disorders -4th ed) DSM-IV	Boy & Girl	7-10
Firoz Kohimoghadam et al.	8.75mg	ADHD Rating Scale	Diagnostic Statistical Manual of Mental Disorders -4th ed) DSM-IV ADHD Rating Scale	Boy & Girl	6-12
Karahmadi et al.	0.3-2 mg	Conners parent rating scale	Diagnostic Statistical Manual of Mental Disorders -4th ed) (DSM-IV	Boy & Girl	7-12
Alirezaei motlagh et al.	-	Child Symptoms Inventory (CSI-4), Conners rating scale	Diagnostic interview, Conners parent rating Scale	Boy	6-12
Faker et al.	5mg	ADHD Rating Scale	Diagnostic Statistical Manual of Mental Disorders -4th ed DSM-IV), ADHD Rating Scale	Boy & Girl	6-12
Yaghobi et al.	-	Conners parent rating scale	Diagnostic Statistical Manual of Mental Disorders -4th ed) DSM-IV	Boy	6-12
Mohammadi et al.	5mg	Conners rating scale	Diagnostic interview	Boy & Girl	18-50
Sadr Ameli et al.	75mg	Conners parent rating scale	Diagnostic interview	Boy & Girl	6-17
Zareei et al.	-	Child Symptoms Inventory (CSI-4)	Diagnostic interview	Boy & Girl	7-12

Table 4. List of articles that was not criteria in the methodological meta-analysis

Number	Researcher	Title
1	Saheban et al.	The effectiveness of Short-term training, of executive functions, to reduce the symptoms of ADHD in Isfahan elementary school students
2	Ghasabi et al.	The effectiveness of self Verbal training on reduction Excitation symptoms in children with ADHD
3	Hoosh var et al.	The effectiveness of parents group training with ADHD children four to ten years old on the rate of their children's behavior disorders
4	Mir nasab et al.	The effectiveness of behavior and cognitive Behaviorl therapy on reduced clinical symptoms
5	Hashemi Nosrat Abad et al.	The effectiveness of self-regulation training behavior motivation on attention deficit and hyperactivity symptoms in third grade male students in Tabriz: A comparative study
6	Naserizade et al.	Training of Cognitive – behavioral method to mothers with ADHD children and effect on reducing disorder and improving the interaction between parent - child
7	Janatian et al.	ADHD The effectiveness of play therapy based on cognitive - behavioral approach on severity symptoms of ADHD in boys with ADHD
8	Alizade et al.	Effects of life skills training on marital satisfaction and behavior problems in students with ADHD
9	Rezazade et al.	Effects of educational games on reduction the symptoms of ADHD in Isfahan school
10	Pasha soltani et al.	The effectiveness of problem solving training on reduce the symptoms of ADHD in fifth grade student in Ilam
11	Abdolahian et al.	Investigate the prevalence of ADHD on pre-school children in Mashhad
12	Habrani et al.	Comparison of comorbidity Disorders in boys and girls with ADHD
13	Kousha et al.	Relationship between substance abuse and ADHD in adolescents
14	Khosro Pour et al.	Relationship between Emotional characteristics, Depression and intelligence quotient in children with ADHD
15	Karahmadi et al.	Comparison of Parents interaction patterns in children with ADHD and control group
16	Khoshabi et al.	Investigate the role of nature factors and other risk factors in children with ADHD

Table 5. Meta-analysis results efficacy of methylphenidate on reducing ADHD symptoms

Row	*p*-value	Rate of Effect
1	0.13	0.75
2	0.05	2.11
3	0.05	1.26
4	0.01	0.70
5	0.01	1.60
6	0.04	1.37
7	0.001	14.04
8	0.01	1.19
9	0.001	4.45
10	0.05	1.19
11	0.001	2.02
12	0.001	0.80
13	0.001	2.98
14	0.05	6.88
15	0.05	5.91
16	0.02	0.80
17	0.005	0.71
18	0.05	0.54
19	0.001	0.60
20	0.05	0.31

Such findings are in societies such as our community are more important but more diverse. Because of this diversity, there are more differences. Inevitably there had been various information from various examples of this community to integrate this information with achieve similarities. And act properly with differences. In present study, total number was 48 researches were eliminated, because of lack of criteria. Largest and most comprehensive source were PhD and MA thesis that survey. Results of this meta-analysis indicated, that methylphenidate drug relatively high impact in reducing the general symptoms of ADHD (d=0.71).

Finding of this meta-analysis is confirmed previous study including: the study Babaie, Alirezaie, Moalemi, Esmaeili, Tizdast, Yaghubi, Eslami, Amiri, Karahmadi, Firozkohi, Faker, Imani, that larg effect sizes are reported, is consistent [26, 28-36, 38]. Also results the present meta-analysis is consistent with results of meta-analysis Raul and Collaborators, Vander ood and Collaborators Faraone and Collaborators, that reported larg effect size.Results [13, 24, 46] Zereei, Mohammadi, Farmand, Imani, indicated that the effect size drug treatment on recovery symptoms of ADHD is the middle level and is inconsistent with present result [25, 38-40]. also present meta-analysis is inconsistent with Kosters and Collaborators meta-analysis findings which can be explained that research`s Kosters has been done on adults with ADHD, this is because the present study contradicts [43].

In the explain present study can be mention due to effect size (0.71), methylphenidate drug can be with psychological interventions, inhabit symptoms of ADHD. Also according to negative attitude of many parents and psychologists toward drug it doesen`t doubt to use drug. Also in explaining these results, it is worth mentioning to consider cultural context in different communities can be effective in various treatment approaches.

For the reduction of ADHD core symptoms, however, both methylphenidate and combined treatments are more effective, than psychosocial treatments alone, which also yield substantial effects. Psychosocial treatment, methylphenidate and their combination are not effective in improving academic functioning.

One of the best characteristics of meta-analysis is provide possibility to compare the efficiency of different treatment patterns in contexts of various cultural. However, the use of various treatment approaches in the treatment of ADHD` problems is essential. But what is better to considered, the success rate of the model is proposed in addressing the problem.

In this meta-analysis was try to by integrating the drug treatments are examined rate of success this model, but only investigated one treatment model and comparison with no treatment is not sufficient and it is better to study the other models of treatment and different drugs. The comparison should be made between different approaches to effectiveness and success of each pattern compared to no treatment and other is more specified is determined.

So in many cases, drug treatment is one of the treatments for children with ADHD but research also confirmed this idea that wide individual differences in the effectiveness of any therapy play an important role (or drug treatment, or psychological treatment or a combination). According to these results, therapist can have their professional patterns of treatment consistent to problems, more scientific selection and achieve to better and more reliable results.

Finally, it should be considered that prerequisite done more meta-analysis in the field of various treatments is essential. It is recommended to examine the patterns of various treatments and identified and compared effect size of other patterns of treatment. So it is recommended to repeat the various issues and investigated more samples of population putting together the results from different samples, better view should be available.

Among the problems and limitations of current research was the lack of a coherent and systematic data bank in the country which prevent achieving researcher for articles and thesis around country. Addition in some of the researches not reported exactly the subjects of gender, age, diagnosis method, assessment tools of disorder.

Acknowledgements

I would like to acknowledge and thank my advisor, Dr. Abedi, and all of my dissertation committee members for their guidance in writing this manuscript. I also would like to thank my family for their support. Any successes and accomplishments I share with those who have been a valuable part in my life.

Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

Funding/Support

University of Payam Nour, Kerman.

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Please cite this article as: Jamali-Paghale S, Abedi A, Aghaei E, Faramarzi S, Gholami A. Meta-analysis of effectiveness of methylphenidate on the rate of ADHD symptoms. Zahedan J Res Med Sci (ZJRMS) 2012; 14(10): 1-9