Review Article

Estimation of Mean Intelligence Quotient with Wechsler Scale in Iran: Systematic Review and Meta-Analysis

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Abstract

The low intelligence quotient (IQ) level is one of the most common and important medical, social, and familial problems in all countries. The current study aimed to estimate mean IQ with the Wechsler scale in Iran by performing a systematic review and meta-analysis. In the current meta-analysis, all articles related to IQ conducted in Iran using the Wechsler scale were deeply searched by reviewing citation databases including Science Direct, PubMed, Scopus, Web of Science, Springer, SID, Magiran, Iranmedex, Medlib, and Google Scholar motor search and using valid keywords without time limits. Due to heterogeneity between studies, a random effects model was used to combine the results of studies. To investigate the heterogeneity of the studies, the I2 index was used. All statistical analyses were performed using STATA software version 11.1. The number of participants in the 51 studies was 5352. The mean total IQ score in Iran was estimated 97.12 (95% confi dence interval [CI]: 88.71–105.52), the practical intelligence was 92.84 (95% CI: 79.14–106.55), and the verbal intelligence was 94.50 (95% CI: 83.90–105.10). The total IQ score in the northern, southern, central, eastern, and western regions of Iran was 97.08, 108.90, 92.31, 101.76, and 96.45, respectively. The mean IQ score in Iran in subjects under 20 years of age is 97.73 and in subjects over 20 years of age is 105.61. There is also no signifi cant relationship between the mean total IQ in Iran and two parameters of the year of research and number of research samples. For prevention of decrease IQ and given that proper nutrition and breastfeeding directly contribute to increase IQ, nutrition should be provided free of charge in poorer areas during pregnancy until baby born. Moreover, the media should provide adequate education for breastfeeding and nutrition, because IQ affects people's academic, occupational, personal, and social performance, and also prevents elite immigration with suitable planning and provides conditions for elites to return to the country.

Keywords: *Iran, intelligence quotient, meta-analysis, practical intelligence, verbal intelligence, Wechsler*

Introduction

Old investigators considered intelligence to be a general or attribute factor that manifests itself in a wide range of behaviors, but later psychologists have stated that intelligence is a set of relatively independent abilities.[1] The analytical concept of the intelligence in Western countries is more cognitive that involves information processing, whereas the Oriental Combined Approach to intelligence encompasses the various components of human performance and experience, including cognition, intuition, and excitement, in an integrated relationship.[2]

Intelligence quotient (IQ) is a number with the mean of 100 and the standard deviation of 15. The IQ is a ratio, the result of dividing the percentage of rational age divided by the calendar age multiplied by 100. Hence, in the classification and division of intelligence, nearly 70% of people have middle intelligence, 12% have intelligence above the middle, 2% are very intelligent, and 1% have been identified as highly selected people.[3,4] The low IQ level is one of the most common and important medical, social, and familial problems in all countries with a similar prevalence of at least 2–3%.[5]

Intelligence is one of the significant means of compromising individuals with the environment and is among the important factors of individual differences.[6] Intelligence and memory affect the academic achievement, career development, and social behavior of individuals. Because memory cannot be seen, touched, or measured with physical

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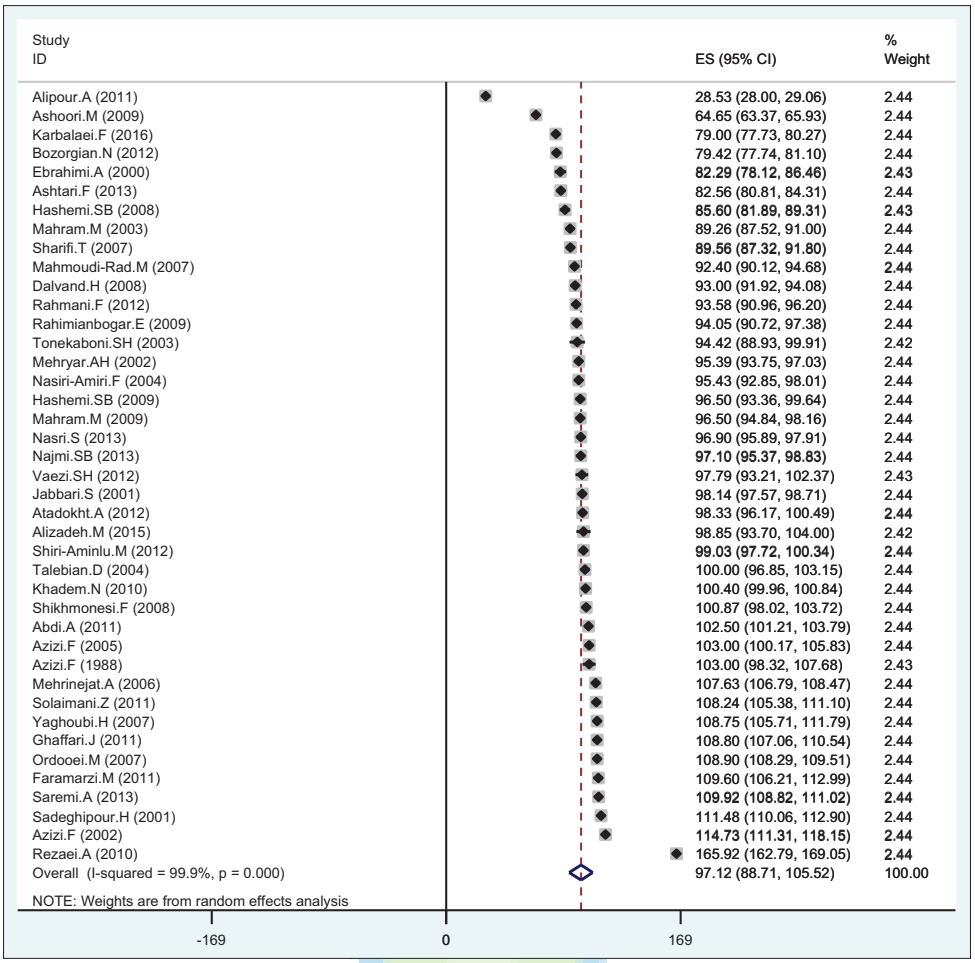


Graph 1: Average total intelligence score and its 95% confidence interval in Iran by the author's name and year of research, based on random effects model. The middle point of each section reveals the overall intelligence score in each study, and the rhizome shows the overall intelligence score in Iran for the whole of the study

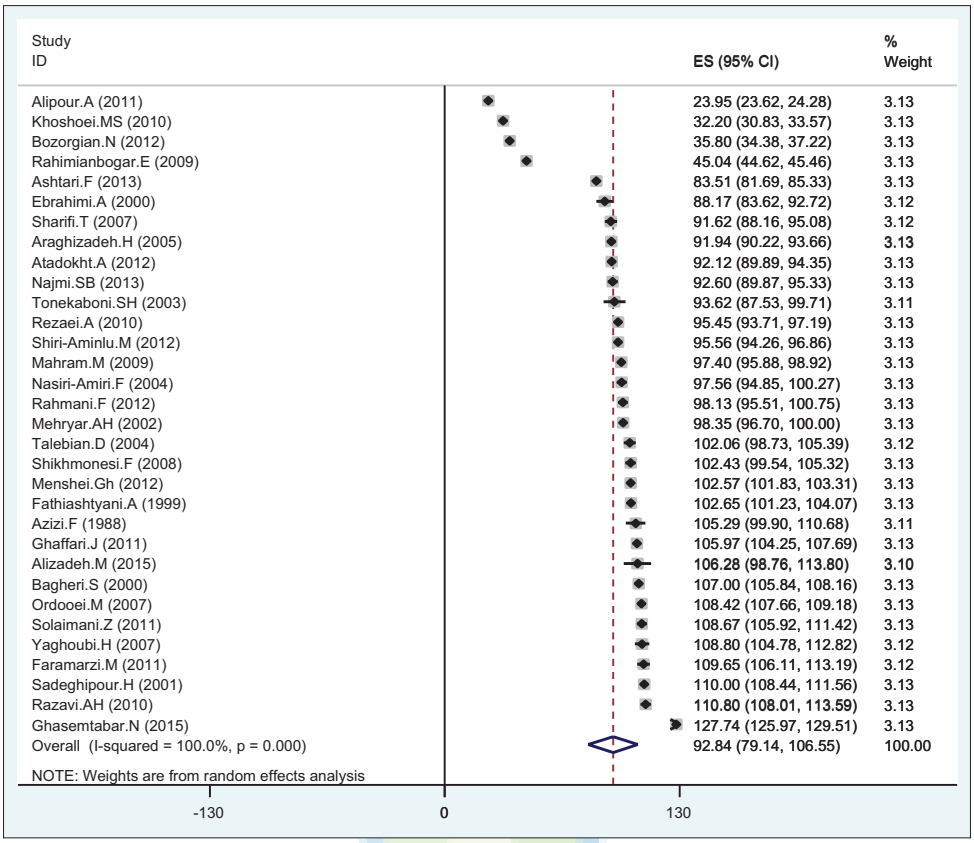
instruments, the Wechsler intelligence test, which is valid and reliable, is used to assess the intelligence of individuals.[7] Wechsler believed that intelligence includes the individual's ability to reasonably think, act purposefully, and deal effectively with the environment, and thus, it can have social, practical, or abstractive IQ.[8]

Individual intelligence consists of two parts including verbal intelligence and practical intelligence. The verbal intelligence refers to the degree of fluency in the language. In other words, this type of intelligence refers to the ability to use and understand a rhetorical language that helps people remember things and express them.[9] Practical intelligence is what most people call "common sense." Practical intelligence in daily life is useful and necessary because without practical intelligence, in the cultural context, or in the natural environment of life, one cannot survive.[10] According to numerous studies conducted in the field of IQ assessment using the Wechsler scale in Iran, the estimation of mean IQ with Wechsler scale in Iran was by a systematic review and meta-analysis was the main aim of the current study.

Methods

Search strategy

The present study is a systematic review and meta-analysis that was conducted through the review of existing articles and dissertations. To access the documentation in Iran, internal and external databases including Science Direct, PubMed, Scopus, Web of Science, Springer, SID, Magiran, Iranmedex, Medlib, and Google Scholar motor search were searched using the relevance keywords without time limits. The documents found were specified to the period from 1989 to 2017. This study was conducted based on the preferred reporting items for systematic review and meta-analysis.[11] In order to maximize the search comprehensiveness, internal databases were searched using general Persian words such as "IQ, Intelligence, Verbal Intelligence, Wechsler, Meta-Analysis, and Iran." For English databases, the Latin and Mesh equivalents and their combinations were used with AND, OR operators. To find more studies, the sources of other articles were searched manually.



Graph 2: Mean score of practical intelligence and its 95% confidence interval in Iran by author's name and year of research, based on random effects model

Inclusion and exclusion criteria

Entry criteria included the studies that examined the general intelligence, verbal intelligence, or practical intelligence in Iran using the Wechsler scale. Exit criteria included the studies conducted in countries other than Iran, studies with nonrandom samples, nonquality studies, studies that did not include the required information (such as total intelligence score, verbal intelligence, practical intelligence, and sample number), and studies that used a tool other than the Wechsler intelligence test to measure human intelligence.

Qualitative assessment of studies

In order to assess the quality of the studies, the Strengthening the Reporting of Observational Studies in Epidemiology[12] was used. This checklist consists of 22 different sections, with a score of 0–44 and a minimum score of 16 points.

Data extraction

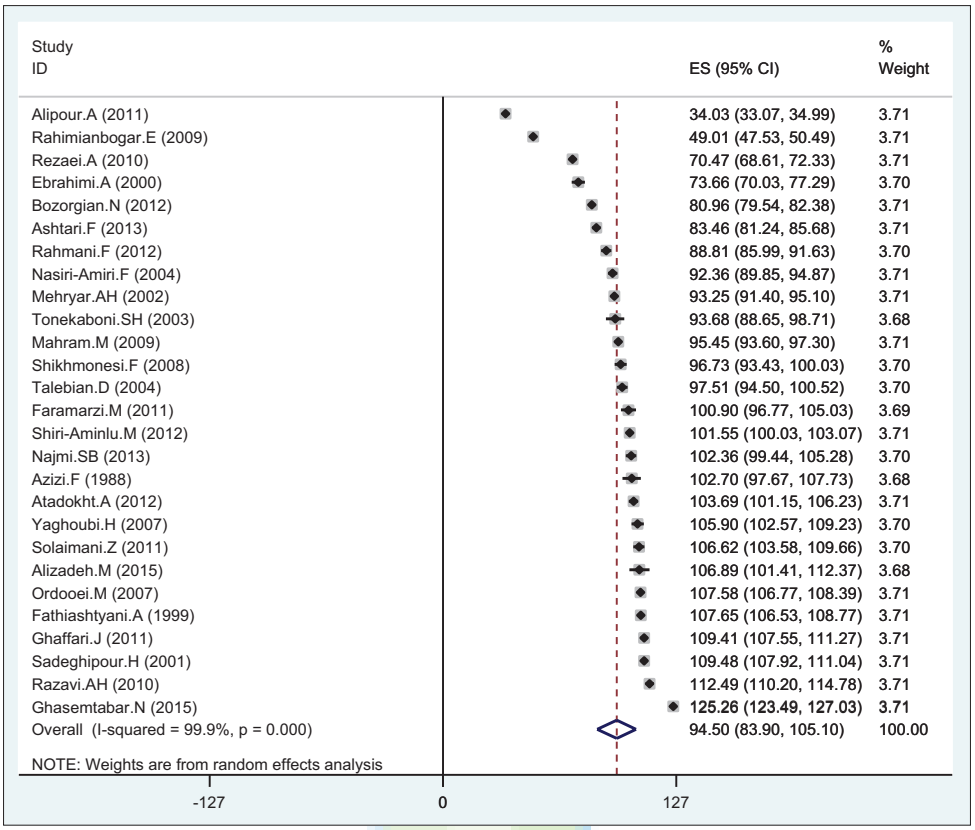
To reduce the bias and error in collecting data, two researchers extracted data from articles independently and using data extraction form including name of the author, year and place of the study, number of samples, overall intelligence score, verbal intelligence score, practical intelligence score, number of women and men, and so on, and the third researcher will examine the data in order to correct the data in case of conflict.

Questionnaire

In this research, the Wechsler intelligence test was used. This scale, designed by Wechsler, measures the intelligence in both practical and verbal dimensions, which has 11 subscales including 6 verbal scale and 5 practical scales. The subtests of general information, numeric memory, vocabulary, computing, comprehension and similarities, verbal intelligence and image completion, image adjustment, cube design, and component insertion make practical intelligence. Each subscale has a raw score and a standard score. Each person ultimately has a verbal intelligence, a practical intelligence, and a general intelligence.[13,14]

Statistical analysis

Considering that the IQ score and its subgroups were quantitative, the mean and standard deviations of these indices were extracted in each study and the variance of the meanings was calculated using the normal distribution. Due to heterogeneity between studies, a random-effects model was used to combine their results. To investigate the heterogeneity of the studies, the I^2 index was used. The sensitivity analysis was used to show that the deletion of each study might affect the final outcome of the study. The meta-regression was also used to investigate the relationship between the intelligence of Iranians and the number of samples and years of research and explore of



Graph 3: The mean score of verbal intelligence and its 95% confidence interval in Iran by author's name and year of research, based on the random effects model

heterogeneity. All statistical analyses were performed using STATA software version 11.1.

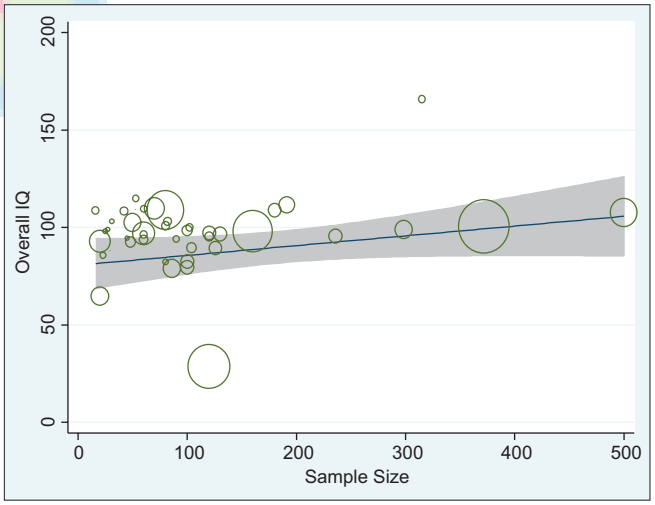
Results

Summary of how to enter studies into the meta-analysis process

The number of participants in the 51 studies was 5352. The characteristics of the papers examined are listed in Table 1 and the stages of the entry of studies into the meta-analysis process are presented in Graph 1 and Figure 1.

The mean total IQ score in Iran was 97.12 (95% confidence interval [CI]: 88.71–105.52), practical intelligence was 92.84 (95% CI: 79.14–106.55), and verbal intelligence was 94.50 (95% CI: 83.90–105.10) [Graphs 1-3].

According to the graph,[4] there is no meaningful relation between the mean total intelligence score in Iran and the number of research samples ($P = 0.076$) [Graph 4]. According to the graph,[5] there is also no significant relationship between the mean total IQ in Iran and the year of research ($P = 0.520$) [Graph 5].



Graph 4: The relationship between the mean score of intelligence with Wechsler scale in Iran and the number of research samples using meta-regression

Discussion

The sample size was 5352 in 51 of the studied researches. The mean total IQ was 12.97, practical intelligence was 84.92, and verbal intelligence was 94.35. The results show that verbal intelligence score in Iran is more than practical intelligence. In a study by Joshua Isen in the United States, the mean and standard deviation of the practical intelligence score was 89.64 ± 13.35 and the verbal intelligence score was 94.24 ± 14.[61] The verbal intelligence score was greater than the intelligence score, consistent with our study.

In addition, the total IQ score in the northern, southern, central, eastern, and western regions of Iran was 97.08,

Table 1: Information extracted from articles entered into the meta-analysis process

Author	Year of study	City of study	Age	Type of study	Overall IQ (mean)	Overall IQ (SD)	Sample size
Bezorgyan[13]	2012	Yasouj	28.08	-	79.42	8.55	100
Rahimian Bugar[15]	2009	Semnan	9-11	Causal-comparative	94.05	16.11	90
Sharifi[16]	2007	Chaharmahal va bakhtyari	6-15	Causal-comparative	89.56	11.68	104
Sheykh Mounesi[17]	2008	Mazandaran	-	Causal-comparative	100.87	13	80
Mehry Nejad[18]	2006	Tehran	<11	-	107.63	9.54	500
Araghizade[7]	2005	Tehran	>40	-	-	-	64
Fathi Ashtiani[14]	1999	Tehran	9	-	-	-	60
Ebrahimi[19]	2000	Isfahan	>40	-	82.29	19.02	80
Bagheri[20]	2000	Tabriz	7	Causal-comparative	-	-	240
Soleymani[21]	2011	Tehran	4-6.5	Association study	108.24	9.45	42
Tavakoli[22]	2007	Isfahan	27	Association study	88.06	-	29
Razavi[23]	2010-2011	Neyshabur	5-6.5	Descriptive-analytical	-	-	80
Alizade[24]	2015-2016	Isfahan	7-15	Before-after study	98.85	13.65	27
Soghraei Karbalaei[25]	2016	Systan and Baluchestan	12-18	Descriptive-analytical	79	6	86
Ghasem Tabar[26]	2015	Tehran	5	Before-after study	-	-	30
Nasri[27]	2013-2014	Rasht	8	Before-after study	96.9	4.01	60
Atadokht[28]	2012-2013	Ardebil	7-11	Causal-comparative	98.33	11.01	100
Manshaei[29]	2012-2013	Isfahan	6-12	Causal-comparative	-	-	90
Dalvand[30]	2008	Tehran	4-8	Semi-experimental	93	2.47	20
Mahreyar[31]	2002	Shiraz	-	Causal-comparative	95.39	12.84	236
Mahram[32]	2003	Zanjan	7.3	Historical cohort	89.26	9.96	126
Sadeghi Poor[33]	2001	Tehran	4-13	Historical cohort	111.48	10	191
Azizi[34]	2005	Tehran	4-7	Historical cohort	103	13.07	82
Nasiri Amiri[35]	2004-2007	Babol	6-7	Prospective cohort	95.43	14.41	120
Yasseri[36]	2005	-	25-45	-	109.35		52
Shiri Aminloo[37]	2012-2013	-	6-12	-	99.03	11.53	298
Yaghoubi[38]	2007	Tehran	-	Semi-experimental	108.75	6.2	16
Mahmoodi Rad[39]	2007	Tehran	9	Before-after study	92.4	8.05	48
Khoshouei[40]	2010-2011	Isfahan	6-7	Comparative	-	-	50
Ashuri[41]	2009-2010	Tehran	13-17	Before-after study	64.65	2.91	20
Hashemi[42]	2008-2009	Fars	6-9	Semi-experimental	85.6	9.08	23
Abdi[43]	2011	Tehran	30-50	-	102.5	4.67	50
Alipour[1]	2011	Tehran	-	Descriptive	28.53	2.97	120
Rezaei[44]	2010-2011	Tabriz	22.1	Descriptive	165.92	28.31	315
Jabbari[45]	2001	Shiraz	10-12	Comparative	98.14	3.67	160
Talebian[46]	2004-2006	Tehran	4-6	Historical cohort	100	16.23	102
Rahmani[47]	2012	Sanandaj	27.06	Before-after study	93.58	10.34	60
Vaezi[9]	2012	Tehran	8-10	-	97.79	11.69	25
Hashemi[48]	2009-2011	Fars	6-9	Experimental	96.5	12.42	60
Ashtari[49]	2013	Isfahan	19-60	Cross-sectional	82.56	8.91	100
Saremi[50]	2013-2015	Mashhad	20-40	Causal-comparative	109.92	4.7	70
Ghaffari[51]	2011	Mazandaran	6-14	Comparative	108.8	11.92	180
Ahmadi[52]	2014	Yazd	6-9	-	105.87	-	75
Khadem[53]	2010	Mashhad	6-7	Cross-sectional	100.4	4.33	372
Faramarzi[54]	2011-2012	Babol	5-6.5	Cross-sectional	109.6	13.41	60
Tonekaboni[55]	2003-2004	Tehran	6-12	-	94.42	18.8	45
Azizi[56]	2002	Tehran	3-11	-	114.73	12.7	53
Azizi[57]	1377	Tehran	4-6	-	103	13.29	31
Najmi[58]	2013	Isfahan	4.5	Comparative	97.1	9.66	120
Mahram[59]	2009	Zanjan	6	Cohort	96.5	9.66	130
Ordooei[60]	2007	Yazd	5	Case-control	108.9	2.78	80

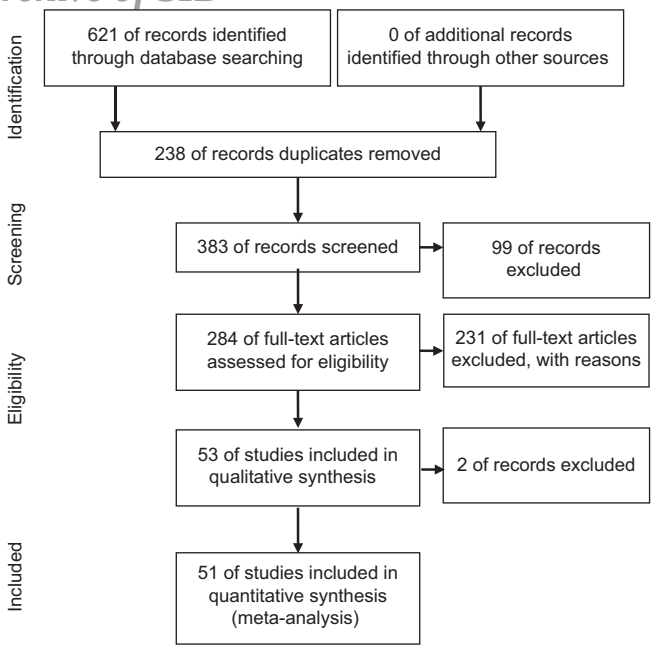


Figure 1: The process of entering the researches into systematic review and meta-analysis

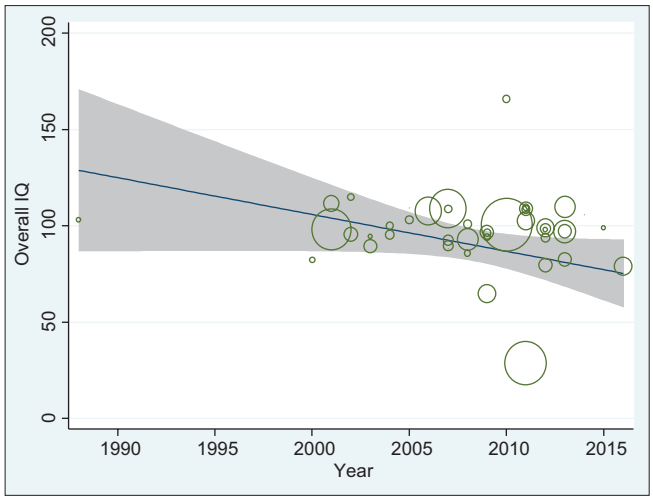
108.90, 92.31, 101.76, and 96.45, respectively. Based on these results, the people of southern Iran have the highest IQ and the people of the central region of Iran have the lowest IQ [Table 2].

An analysis based on the age of the participants showed that the mean IQ score in Iran in subjects under 20 years of age is 97.73 and in subjects over 20 years of age is 105.61. This suggests that the intelligence of Iranians increases with age and adults are more intelligent than children and adolescents.

In the graph,[4] meta-regression showed no significant relationship between the general IQ in Iran and the number of research samples. Thus, by increasing the number of samples, the average total IQ in Iran will not increase. Graph[5] also showed no meaningful relationship between the general intelligence score in Iran and the year of research. During the years under review, from 1367 to 1396, the mean total IQ in Iran has decreased, but this decline was not statistically significant.

Sensitivity analysis showed that by eliminating Rezaei *et al*.[44] study in 2011, the mean IQ increased to 95.39% (95% CI: 87.01–103.77), and by eliminating Alipour *et al*. study[1] in 2011, this amount will increase to 98.82 (95% CI: 95.40–102.23). As a result, these two studies are the most effective studies in obtaining the final result.

According to statistics and measurements conducted in Western countries, the average IQ of the first year students of universities is between 100 and 110. Masters and Ph.D. students have an IQ of over 120 and 130.[62]



Graph 5: The relationship between the mean scores of intelligence with the Wechsler scale in Iran and the year of the research using meta-regression

According to the global ranking, Iran with an average IQ of 84 is in the 98th position, which can improve its position using the results of this study. Also according to the results of the study by Joseph *et al.* in the United States, the average overall IQ was 85/90.[63] According to the statistics, Iranian intelligence is more than the people of the United States. The results of the study showed that breast milk, breakfast, and proper education during the study had a direct impact on the increase in IQ. Other factors which had impact on IQ are chronic diseases, administration of proper antioxidants, and other micronutrients[56,64-69] Because families with high incomes have a better and more moderate diet than low-income families,[70] chronic diseases affect mental, physical, and psychological status.[71-74]

The main limitations of this research included the failure to provide accurate statistics on the IQ of other countries in existing resources, the lack of access to the full text of some articles, and the inability of internal databases to combine the keywords.

Conclusions

The people of Iran have high intelligence and their verbal intelligence is more than their practical intelligence. From the geographic point of view, the people of southern Iran have the highest intelligence and the people of eastern Iran have the least IQ. In terms of age, people under the age of 20 years have a lower IQ than people over the age of 20 years. According to the results of meta-analysis, Iran's IQs have decreased in recent years, but this decline has not been statistically significant. Given that proper nutrition and breastfeeding directly contribute to IQ, nutrition should be provided free of charge in poorer areas during pregnancy until baby born. Moreover, the media should provide adequate education for breastfeeding and nutrition, because IQ affects people's academic, occupational, personal, and social performance.

Table 2: Results of meta-analysis of Iranian intelligence using the Wechsler scale

Subgroups	Number of study	Mean IQ	95% CI		*P* for heterogeneity	I^2 (%)
			Lower	Upper		
Overall IQ	41	97.12	88.71	105.52	0.000	99.9
Practical IQ	27	94.50	83.90	105.10	0.000	99.9
Verbal IQ	32	92.84	79.14	106.55	0.000	100
Climate						
North	19	97.08	80.15	114.01	0.000	100
South	1	108.90	108.29	109.51	-	-
Center	9	92.31	88.04	96.57	0.000	97.8
West	7	101.76	86.31	117.22	0.000	99.7
East	3	96.45	82.73	100.34	0.000	99.9
Age						
>20	30	97.73	94.21	101.24	0.000	99.5
>20	6	105.61	88.92	122.31	0.000	100

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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Conflicts of interest

There are no conflicts of interest.

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