

# Systematic Review and Meta-Analysis on Quality of Life in Diabetic Patients in Iran

## Abstract

**Background:** Diabetes is the fifth leading cause of death in the world, which reduces the patients' quality of life (QOL) and is considered as an important subject especially in medicine and medical community. The present study aimed at investigating the QOL of diabetic patients in Iran through meta-analysis. **Methods:** The search was conducted using relevant keywords in national and international databases including Iranmedex, SID, Magiran, IranDoc, Medlib, Science Direct, PubMed, Scopus, Cochrane, Embase, Web of Science. Questionnaires WHOQOL, SF-36, SF-20, DQOL, QOL, PedsQL, ADDQOL, D-39, DQOL-BCI, SWED-QUAL, IRDQOL, PHG-2, EQ-5D, and IDQOL-BCI were used to assess the QOL. Heterogeneity of studies was assessed using I<sup>2</sup> index. Data were analyzed using STATA version 11. **Results:** In 96 studies of 17,994 people, the mean score of QOL in diabetic patients was based on the questionnaires WHOQOL [66.55 (95% CI: 45.83, 87.26)], D-39 [129.43 (95%CI: 88.77, 170.10)], SF-36 [65.64 (95% CI: 59.82, 71.46)], SF-20 [46.50 (95% CI: 37.19, 55.81)], DQOL [61.19 (95% CI: 35.73, 86.66)], QOL [117.91 (95% CI: -62.97, 298.79)], PedsQL [34.36 (95% CI: -31.49, 100.22)], ADDQOL [41.76 (95% CI: 12.01-71.50)], SWED-QUAL [59.19 (95% CI: 21.15, 97.23)], IRDQOL [105.92 (95% CI: 102.73, 109.10)], PHG-2 [61.00 (95%CI: 59.63, 62.37)], EQ-5D [0.62 (95% CI: 0.61, 0.64)], DQOL-BCI [3.40 (95% CI: 3.31, 3.49)], and IDQOL-BCI [22.63 (95% CI: -2.38, 47.64)]. **Conclusions:** The QOL of diabetic patients was evaluated according to different types of questionnaires and the QOL of diabetic patients was found to be lower than normal population.

**Keywords:** Diabetes, meta-analysis, quality of life, systematic review

## Introduction

World Health Organization defines quality of life (QOL) as an individuals' understanding of living condition in terms of culture and the prevailing community values following their goals, expectations, standards, and interests. Hence, QOL is closely related to physical, psychological, and mental condition, personal beliefs, level of self-reliance, mass communication, and environment.<sup>[1-6]</sup> One reason for the multidimensional complexity of QOL is that it includes different aspects of an individual's life. Another reason is that each individual has his/her own unique characteristics and his/her perception of a good or poor QOL is unique to that person.<sup>[1-9]</sup> The subject of QOL is important since it may lead to frustration, lack of motivation for any attempt and reduction of social, economic, cultural,

and health activities. QOL influences the socioeconomic development of a country in deeper dimensions. Modifying the QOL is considered as a part of disease control program.<sup>[7-9]</sup>

Diabetes is known as a "silent epidemic" and is considered a major public health problem in the United States and other parts of the world, including Iran. It is the most prevalent metabolic disease with an increasing incidence, which shortens life expectancy by one third<sup>[10-12]</sup> and affects various aspects of a patient's life, including psychological, physical, social, and economic condition, family life and sexual function.<sup>[13-16]</sup> Type 1 and type 2 diabetes are two major forms of this disease and include about 10--90% of the diabetes population, respectively.<sup>[17]</sup>

1. According to the latest available data, about 171 million people suffer from diabetes worldwide. Asia is one of the regions with a high prevalence of diabetes.<sup>[18]</sup> Two percent of the Iranian population are suffering from

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1 Quality of life

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the disease.<sup>[19]</sup> Due to the large proportion of diabetic patients in Iran and the direct impact of diabetes on the QOL of patients with diabetes, the present study aims to evaluate the QOL in diabetic patients in Iran. Considering that a meta-analysis study of the same title was published in 2016<sup>[20]</sup> and evaluated only two questionnaires (SF-20 and SF-36). Also the previous meta-analysis included only the results of 10 studies. The present meta-analysis was performed with the aim of updating the previous study and without considering the time limit, limiting the type of questionnaire and covering all studies published in this field. In the present meta-analysis, the QOL of diabetic patients was evaluated in the form of levels: Good, Moderate, and Poor. This issue was not presented in previous meta-analysis.

## Methods

### Search strategy

This is a systematic review and meta-analysis aimed at investigating the QOL of diabetic patients in Iran. In order to achieve the related documentation in Persian and English, two researchers independently searched both national and international databases, including Iranmedex, SID, Magiran, Iran-Doc, Med-Lib, Science-Direct, PubMed, Scopus, Cochrane, Embase, Web of Science, and Medline using related Persian keywords and their English equivalents: “Iran,” “meta-analysis,” “diabetes,” and “quality of life.” The keywords were searched using AND/OR operators. The search was performed without time limit until 22.04.2020. However, the articles in question were published between 2003 and 2020. The previous meta-analysis article published in this field belonged to 2016<sup>[20]</sup> and only examined the SF-20 and SF-36 questionnaires, while the current meta-analysis did not impose any restrictions on the type of questionnaires used in the reviewed articles. For this reason, various questionnaires such as: WHOQOL, SF-36, SF-20, DQOL, PedsQL, ADDQOL, D-39, DQOL-BCI, SWED-QUAL, and IRDQOL were evaluated. In cases of lack of access to the article’s full text, the researchers asked the corresponding author for the full-text articles via email. To complete the search, Google Scholar was also searched.

### Inclusion and exclusion criteria

Inclusion criteria included mentioning the QOL of diabetic patients in Iran in Persian and English. Exclusion criteria included non-random sampling, inadequate information in the article’s text, and population other than diabetic patients.

### Study selection

In the first phase of the search, 501 articles related to QOL of diabetic patients were found. After reviewing the titles, 289 duplicate and overlapping articles were

excluded. Abstracts of all remaining articles were reviewed and 59 irrelevant articles were excluded. The full text of the remaining articles was reviewed then 57 studies were excluded due to having the exclusion criteria. Finally, 96 articles entered the qualitative evaluation stage [Chart 1].

### Qualitative evaluation of studies

To check the quality of studies, the STROBE checklist (strengthening the reporting of observational studies in epidemiology)<sup>[21]</sup> was applied. This checklist includes 22 items that cover different parts of a report (sampling, measuring variables, objectives of the study, and statistical analysis). Each item was given one point and higher points were given to other items that we considered more important. In this phase, four unqualified articles were excluded and finally 96 articles entered the meta-analysis stage.

### Data extraction

To reduce bias in reporting and error in data collection, two researchers independently extracted data from articles and entered the data into a checklist, which included the following items: The first author’s name, title of study, sample size, year of publication, city of study, diabetes type, questionnaire title, the subjects’ average age, mean and standard deviation of the QOL of diabetic patients, mean and standard deviation of quality of life dimensions, etc.

### Statistical analysis

Considering that the QOL in diabetic patients score and its subgroups score were quantitative, the mean and standard deviation of these indices were extracted in each study and the variance of the mean was calculated using normal distribution. Considering the heterogeneity of the studies, a random effects model was used to combine the results of the studies. The  $I^2$  index was used to investigate the heterogeneity of the studies. A random effects meta-analysis was used to give a pooled estimate of prevalence of QOL for each measure. Metaregression was used to check heterogeneity

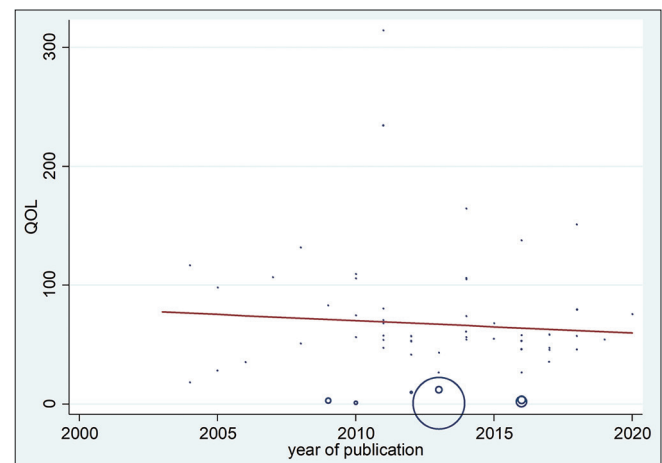


Figure 1: The relationship between quality of life score in diabetic patients and the year of publication

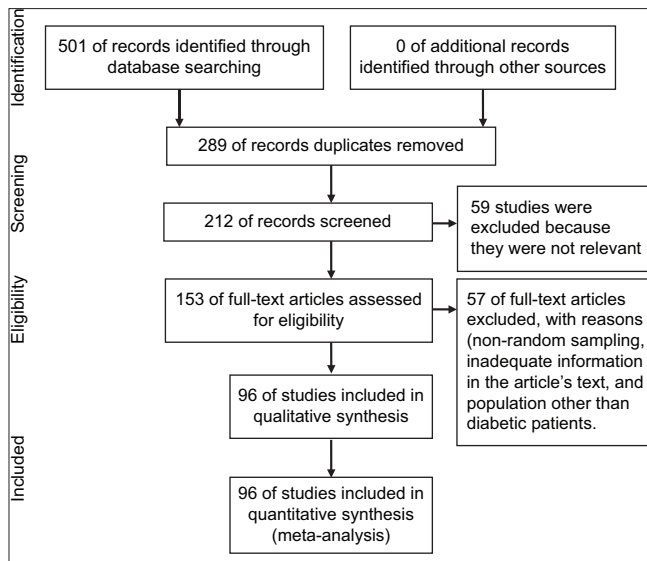


Chart 1: Flowchart of the entrance of studies into the systematic review and meta-analysis

among the studies and to find any association between the year of publication and the sample size with QOL in diabetic patients. Subgroup analysis was done according to sex, components, and questionnaire. All statistical analyses were performed using STATA ver 14. The significance level of the tests was considered to be  $P < 0.05$ .

## Results

In 96 reviewed studies with a sample of 17,994, the mean QOL score in diabetic patients was based on WHO Quality of Life-BREF (WHOQOL-BREF) [66.55 (95% CI: 45.83, 87.26)], D-39 [129.43 (95% CI: 88.77, 170.10)], *Short Form-36* (SF-36) [65.64 (95% CI: 59.82, 71.46)], *Short Form-20* (SF-20) [46.50 (95% CI: 37.19, 55.81)], Diabetes Quality of Life (DQOL) [61.19 (95% CI: 35.73, 86.66)], Quality of Life [QOL] (117.91 (95% CI: -62.97, 298.79)], PedsQL [34.36 (95% CI: -31.49, 100.22)], Audit of Diabetes Dependent Quality of Life (ADDQOL) [41.76 (95% CI: 12.01-71.50)], SWED-QUAL [59.19 (95% CI: 21.15, 97.23)], IRDQOL [105.92 (95% CI: 102.73, 109.10)], PHG-2 [61.00 (95% CI: 59.63, 62.37)], EQ-5D [0.62 (95% CI: 0.61, 0.64)], DQOL-BCI [3.40 (95% CI: 3.31, 3.49)], and Iranian version of the Diabetes Quality of Life Brief Clinical Inventory (IDQOL-BCI) [22.63 (95% CI: -2.38, 47.64)]. Considering the heterogeneity between the studies, the confidence interval for each study based on random-effects model is shown in Table 1.

According to the results, the mean QOL score in diabetic patients is presented in Table 2. In the WHOQOL-BREF2 questionnaire, the highest and lowest scores of QOL score in diabetic patients were related to **Social Activity** (48.36) and the **Mental** (36.29), respectively. In the SF-36

questionnaire, the highest and lowest quality of life scores of diabetic patients were related to **Limitation of Activity** (52.72) and **Peripheral** (24.10), respectively. The mental dimension (20.75) and the **Peripheral** (9.60) had the highest and lowest QOL scores of diabetic patients in the SF-203 questionnaire. In the DQOL4 questionnaire, the highest and lowest QOL scores of diabetic patients were related to **General Health** dimension (41.25) and **Social Activity** (13.46), respectively. In the QOL5 questionnaire, the **Peripheral** dimension (20.23) and the **Social Activity** dimension (5.18) had the highest and lowest QOL scores of diabetic patients, respectively. In the PedsQL6 questionnaire, the highest and lowest QOL scores of diabetic patients were related to **Emotion** dimension (59.84) and **Peripheral** dimension (33.15), respectively. In the SWED-QUAL questionnaire, the highest and lowest QOL scores of diabetic patients were related to **Physical** dimension (21.84) and **Physical Pain** dimension (8.07), respectively. In the IRDQOL questionnaire, the highest and lowest QOL scores of diabetic patients were related to **Social Activity** dimension (69.53) and **Physical** dimension (57.03), respectively. In the PHG-2 questionnaire, the highest and lowest QOL scores of diabetic patients were related to **Physical** dimension (16.43) and **Emotion** dimension (9.84), respectively.

In the Sf-36 questionnaire, 15% of diabetic patients had a good QOL and 46% had a poor QOL. In the Sf-20 questionnaire, 29% of diabetic patients had a good QOL and 36% had a low QOL. In the QOL questionnaire, 36% of diabetic patients had a desirable QOL and 45% had a poor QOL. In the WHOQOL questionnaire, 55% of diabetic patients had an acceptable QOL and 37% had a poor QOL. In the SWED-QUAL questionnaire, 62% of diabetic patients had an acceptable QOL and 38% had a poor QOL. In the IRDQOL questionnaire, 11% of diabetic patients had an acceptable QOL and 66% had a poor QOL [Table 3].

In order to perform additional analyzes, we plotted the meta-regression diagram. There was no significant statistical relationship in the study of meta-regression score of quality of life in diabetic patients based on the year of study ( $P = 0.565$ ) [Figure 1]. This means that over time, the QOL of diabetic patients has not decreased. The relationship between QOL score in diabetic patients and the number of research samples was not statistically significant ( $P = 0.106$ ) [Figure 2].

## Discussion

In 96 reviewed studies with a sample of 17,994, the QOL score in diabetic patients was 66.55 in WHOQOL, 65.64 in SF-36, 46.50 in SF-20, 61.19 in DQOL, 117.91

2 WHO Quality of Life-BREF

3 Short Form

4 Diabetes Quality of Life

5 Quality of Life

6 Pediatric Quality of Life Inventory

**Table 1: Specifications of reviewed articles on the status of the quality of life of diabetic patients in Iran**

ID	Author	Year of publication	City of study	Type of diabet	Sample size	Age mean	Questionnaire	Mean score of QOL	SD of QOL
[22]	Aghamolaei T	2003	Hormozgan	type 2	80	32-72	WHOQOL-BREF		
[23]	Aghamolaei T	2005	Hormozgan	type 2	71	51.3	WHOQOL-BREF		
[24]	Sadeghie Ahari S	2008	Ardebil	type 2	110	52.5	SF-36		
[25]	Ahmadi A	2011	Chaharmahal& Bakhtiari	type 2	254	30-65	Developed by reserch team		
[26]	Alavi A	2010	Chaharmahal& Bakhtiari	type 1	22	15.33	PedsQL	0.78	0.48
[27]	Baghianimoghadam MH	2008	Yazd	type 2	120	25-75	SF-20	51.03	17.04
[28]	Bazzazian S	2010	Tehran	type 1	300	18-30	D-39	109.47	45.31
[29]	Borzou SR	2010	Hamedan	type 2	165		SF-36		
[30]	Safarabadi-Farahani T	2010	Tehran	type 1	70	14.94	DQOL for youth	56.28	12.2
[31]	Ghanbari A	2004	Guilan	type 2	90	>40	SWED-QUAL	18.37	12.5
[32]	Ghanbari A	2005	East-Azerbaijan	type 2	117	>35	SWED-QUAL	28	8.1
[33]	Haririan HR	2009	East-Azerbaijan	type 2	150	20-60	SWED-QUAL		
[34]	Heydari M	2007	Zanjan	type 1	47	11-20.	Developed by reserch team	106.65	45.75
[35]	Jafari P	2011	Fars	type 1	94	8-.18	PedsQL	67.98	14.03
[36]	Ghavami H	2005	west-Azerbaijan	type 2	74	40-65	Developed by reserch team	98	
[37]	Shahab-Jahanlou AR	2011	Hormozgan	type 2	256	27-72	WHOQOL-BREF26		
[38]	Shahab-Jahanlou AR	2011	Hormozgan	typ1& type 2	76	49.15	IRDQOL		
[1]	Darvishpour-Kakhaki A	2005	Tehran	typ1& type 2	131	47.3	SF-36		
[39]	Sedaghati-Kasbakhi M	2008	Mazandaran	type 2	70		SWED-QUAL	131.72	25.88
[40]	Kermansaravi F	2012	Sistan and Baluchestan	type 1	100	14.6	DQOL for youth	52.65	14.58
[41]	Khaledi S	2011	Kurdistan	type 2	198	>18	SF-36	70.82	18.97
[42]	Khamseh MA	2011	Tehran	type 1	150	22.14	Developed by reserch team	69.01	13.03
[43]	Peymani M	2007	Tehran	typ 1 and type 2	302	>18	Developed by reserch team		
[44]	Rakhshanderu S	2006	Tehran	type 2	40	40-65	DQOL	35.2	9.1
[45]	Rasouli D	2011	Tehran	patients with deiabetic foot ulcer	120	54.23	DFS		
[46]	Safavi M	2011	Ardebil	type 2	123	30-70	QOL	234.27	5.18
[47]	Sanjari M	2011	Kerman	typ 1 and type 2	132	52.98	SF-36	314.18	138.24
[48]	Shahrjerdi S	2009	Markazi	type 2	27	>35	SF-36	83.08	11.06
[49]	Sayadi N	2011	Khuzestan	type 2	31	58.35	SF-36	1775.81	955.4
[50]	Taghdisi MH	2011	Golestan	type 2	78	49	WHOQOL	80.39	11.35
[51]	Timareh M	2012	Kermanshah	typ 1 and type 2	350	>18	SF-36		
[52]	Vares Z	2010	Isfahan	typ 1 and type 2	310	>18	IRDQOL	105.8	44.1
[53]	Vazirinezhad R	2010	Kerman		101	50.8	SF-36		
[54]	Yekta Z	2011	West-Azerbaijan	type 2	250	60.73	SF-36	57.52	17.1
[38]	Shahab-Jahanlou AR	2011	Hormozgan	typ 1 and type 2	76	49.15	WHOQOL		
[55]	Mirfeizi M	2012	Karaj		180	53.47	IDQOL-BCI	9.89	2.51
[56]	Shahi M	2017	Semnan	type 2	60	57.82	QOL		
[57]	Najafi-Ghezeljeh T	2017	Tehran	type 2	65	54.3	IDQOL-BCI	35.41	7.8
[58]	Shamshirgaran SM	2016	Ardebil	type 2	300	54.13	WHOQOL	53.07	7.09
[59]	Hajian-Tilaki K	2016	Babol		750	67.85	SF-36		
[60]	Dadgostar H	2016	Tehran	type 2	74	49.65	SF-36		
[61]	Jafari N	2014	Isfahan	type 2	203	55.42	PHG-2	61	9.97
[62]	Abdoli S	2015	Malayer	type 2	40	35-85	WHOQOL-BREF		
[63]	Hadi N	2013	Shiraz	typ 1 and type 2	300	50.98	SF-36		

Contd...



**Table 1: Contd...**

ID	Author	Year of publication	City of study	Type of diabet	Sample size	Age mean	Questionnaire	Mean score of QOL	SD of QOL
[64]	Shavandi N	2010	Markazi	type 2	17	48.52	SF-36	74.58	11.34
[65]	Shayeghian Z	2013	Tehran	type 2	100	55.4	ADDQoL	26.63	12.01
[66]	Alipour A	2012	Yaza	type 2	80	46.2	ADDQoL	56.98	18.63
[67]	Afshar M	2014	Kashan	type 2	56	14.75	IRDQOL	106	15.95
[68]	Derakhshanpour F	2015	Gorgan	type 2	330	50.6	WHOQOL-BREF	54.79	13.7
[69]	Zaker MR	2016	Urmia		80		DQOL	46.04	4.3
[70]	Didarloo AR	2016	Khoy	type 2	352	43	WHOQOL-BREF	58.02	17.63
[71]	Gholami A	2013	Neishabour	type 2	1847	59.65	WHOQOL-BREF	12.18	2.3
[72]	Torabi M	2014	Hamedan	type 2	110	47.4	SF-36		
[73]	Izadi A	2014	Khoram Abad	type 2	80	30-70	SF-20		
[74]	Khodabakhsi-Kulaei A	2015	Tafresh	type 2	24	50.58	WHOQOL	68	11.08
[75]	Mohammad-Shahi A	2014	Ahvaz	type 2	110	53.69	SF-36		
[76]	Saeedpour J	2013	Tehran		60	40	SF-36	43.5	15.7
[4]	Masoudi-Alavi N	2004	Tehran	typ 1 and type 2	104	50.5	QOL	116.7	18.8
[77]	Ghasemipour M	2009	Khoram Abad		150	18-65	QOL	2.77	0.79
[78]	Eydi-Bayegi M	2014	Ahvaz	type 2	50	46.2	WHOQOL-26	73.91	14.85
[79]	Sadeghi T	2012	Rafsanjan		70	18-65	SF-36		
[80]	Zaree-Bahramabadi M	2012	Sanandaj	type 2	48	30-50	SF-36	53.3	10.76
[81]	Qashqaei S	2014	Shiraz	type 2	42	35-65	SF-36	56.37	18.25
[82]	Saadatjuo SAR	2012	Birjand	type 2	100	42.82	SF-36	57.29	26.09
[83]	Behrooz B	2016	Kermanshah	type 2	16	49.47	WHOQOL-26	137.92	12.9
[84]	Ebrahimi H	2014	Shahrood	type 2	156	48.11	DQOL	164.53	63.21
[85]	Mohammadshahi GHR	2016	Taybad	type 2	20	47.75	SF-36		
[86]	Shams S	2015	Urmia		80		SF-36		
[87]	Mohammadpour Y	2008	Tabriz	type 2	150		Self-made		
[88]	Ganjluo J	2015	Sabzevar	type 2	75	35-65	ADDQOL-19		
[89]	Bidi F	2012	Bojnord	type 2	40	52.17	SF-20	41.52	16.28
[90]	Derakhshanpour F	2015	Gorgan	type 2	330	51	WHOQOL		
[91]	Bahadori-Khosroshahi J	2011	Tabriz		100	20-60	WHOQOL-26	47.48	16.33
[92]	Fooladvandi M	2014	Kerman	type 2	96	53.08	SF-36	54.21	15.16
[93]	Shahraki-Vahed A	2010	Zabol	typ 1 and type 2	100	>7	SF-36		
[94]	Taghdisi MH	2011	Minudasht	type 2	78	49	WHOQOL-BREF	80.39	11.35
[95]	Sepehrnia I	2011	Karaj		30	40-65	SF-36	53.97	13.09
[96]	Fathi-Ahmadsaraee N	2016	Karaj	type 2	40	42.83	DQOL	26.37	4.51
[97]	Moein M	2014	Kashan	type 2	96	51.45	DQOL	105.23	16.06
[98]	Khalili M	2016	Isfahan	type 2	123	52	DQOL	1.88	0.36
[99]	Hadipour M	2013		type 2	3472	59.4	EQ-5D	0.623	0.387
[100]	Daneshvar S	2018	Ilam	typ 1 and type 2	122	57.74	SF-36		
[101]	Soleimani Z	2016	Sabzevar	typ 1 and type 2	189	51.7	DQOL-BCI	3.4	0.62
[102]	Kaveh MH	2018	Shiraz	type 2	207	55.35	DQOL	45.95	9.67
[103]	Shafiee-Kandjani AR	2018	Tabriz	type 2	263		SF-36	57.52	20.18
[104]	Sotodeh-Asl N	2020	Semnan	type 2	50	>18	SF-36	75.66	12.97
[105]	Tafazoli M	2017	Mashhad	type 2	90	43.58	SF-36	58.75	16.24
[106]	Tavakkoli L	2017	Kerman	type 2	198	54.91	WHOQOL-BREF		
[107]	Borhaninejad, VR	2016	Kerman		120	71.32	SF-36	46.48	20.45
[108]	Zareipour MA	2017		type 2	250	35-65	SF-36	58.32	19.62
[109]	Soleymanian T	2017	Tehran		219	62.2	SF-36	45.7	20.9
[110]	Barzegar Damadi MA	2018	Sari	type 2	15	43.5	D-39	151	33.17
[111]	Shakeri M	2018	Bojnord	type 2	18	53.5	SF-36		
[112]	Marzban A	2018	Yazd	type 2	600	56.11	DQOL	79.34	11.02
[113]	Ghaedrahmati A	2019	Isfahan	type 2	12	44	SF-36	54.25	4.78

**Table 2: The mean QOL score in diabetic patients in Iran based on separate reviewed questionnaires**

Questionnaire	Subgroups: Diabetic Patients' Quality of Life	Number of studies	The quality of life of diabetic patients (CI 95%)	P	I <sup>2</sup> (%)
WHOQOL	Total	10	66.55 (45.83, 87.26)	<0.0001	100
	Men	4	46.41 (14.76, 78.06)	<0.0001	99.8
	Women	4	42.33 (13.92, 70.73)	<0.0001	99.9
	Physical Aspect	15	41.06 (26.35, 55.78)	<0.0001	100
	Mental Aspect	14	36.29 (22.26, 50.33)	<0.0001	100
	Social Activity Aspect	14	48.36 (34.63, 62.09)	<0.0001	100
	Peripheral Aspect	11	36.73 (29.46, 44)	<0.0001	99.9
	General Health Aspect	2	31.70 (-24.34, 87.73)	<0.0001	100
SF-36	Total	19	65.64 (59.82, 71.46)	<0.0001	98.3
	Men	1	49.86 (42.34, 57.38)	-	-
	Women	1	63.62 (56.64, 70.60)	-	-
	Physical Aspect	32	51.97 (42.75, 61.19)	<0.0001	100
	Mental Aspect	31	46.68 (38.99, 54.36)	<0.0001	99.9
	Social Activity Aspect	28	48.42 (41.37, 55.46)	<0.0001	99.9
	Peripheral Aspect	2	24.10 (22.94, 25.26)	0.143	53.4
	Vitality Aspect	24	49.69 (43.26, 56.11)	<0.0001	99.5
	General Health Aspect	24	43.62 (37.0, 50.24)	<0.0001	99.6
	Physical Pain Aspect	26	51.16 (40.61, 61.70)	<0.0001	99.9
	Physical Role Aspect	12	48.31 (42.53, 54.10)	<0.0001	96.5
	Emotion Aspect	15	51.32 (45.18, 57.47)	<0.0001	98.7
	Limitation of Activity Aspect	12	52.72 (33.13, 72.31)	<0.0001	99.7
	SF-20	Total	2	46.50 (37.19, 55.81)	0.002
Men		1	54.80 (49.87, 59.73)	-	-
Women		1	48.47 (44.71, 52.23)	-	-
Physical Aspect		1	16.05 (15.42, 16.68)	-	-
Mental Aspect		1	20.75 (19.99, 21.51)	-	-
Social Activity Aspect		1	18.05 (17.43, 18.67)	-	-
Peripheral Aspect		1	9.60 (9.06, 10.14)	-	-
DQOL		Total	10	61.19 (35.73-86.66)	<0.0001
	Physical Aspect	3	19.81 (8.70, 30.92)	<0.0001	99.9
	Mental Aspect	3	23.67 (10.00, 37.34)	<0.0001	99.9
	Social Activity Aspect	3	13.46 (7.03, 19.89)	<0.0001	99.6
	Peripheral Aspect	2	15.26 (-0.92, 31.44)	<0.0001	99.9
	General Health Aspect	1	41.25 (37.54, 44.96)	-	-
QOL	Total	3	117.91 (-62.97-298.79)	<0.0001	100
	Physical Aspect	2	9.95 (-5.40, 25.29)	<0.0001	99.8
	Mental Aspect	2	8.84 (-3.54, 21.23)	<0.0001	99.7
	Social Activity Aspect	2	5.18 (2.09, 8.26)	<0.0001	98.8
	Peripheral Aspect	1	20.23 (19.13, 21.33)	-	-
PedsQL	Total	2	34.36 (-31.49, 100.22)	<0.0001	100
	Physical Aspect	2	35.06 (-31.78, 101.89)	<0.0001	99.9
	Mental Aspect	2	34.29 (-30.44, 99.03)	<0.0001	99.9
	Social Activity Aspect	2	38.62 (-36.12, 113.37)	<0.0001	99.9
	Peripheral Aspect	2	33.15 (-30.76, 97.07)	<0.0001	99.9
	Emotion Aspect	1	59.84 (55.71, 63.97)	-	-
ADDQOL	Total	2	41.76 (12.01, 71.50)	<0.0001	99.4
	Physical Aspect	1	-1.81 (-1.96, -1.66)	-	-
	Mental Aspect	1	-0.94 (-1.11, -0.76)	-	-
	Social Activity Aspect	1	-0.96 (-1.07, -0.85)	-	-
D-39	Total	2	129.43 (88.77, 170.10)	<0.0001	95.4

Contd...

**Table 2: Contd...**

Questionnaire	Subgroups: Diabetic Patients' Quality of Life	Number of studies	The quality of life of diabetic patients (CI 95%)	P	I <sup>2</sup> (%)
SWED-QUAL	Total	3	59.19 (21.15, 97.23)	<0.0001	99.8
	Physical Aspect	2	21.84 (14.66, 29.02)	<0.0001	98.9
	Physical Pain Aspect	2	8.07 (3.89, 12.26)	<0.0001	98.8
	Physical Role Aspect	1	9.70 (8.89, 10.51)	-	-
	Emotion Aspect	2	20.48 (9.50, 31.47)	<0.0001	99.5
IRDQOL	Total	2	105.92 (102.73, 109.10)	0.952	0
	Physical Aspect	1	57.03 (56.65, 57.41)	-	-
	Mental Aspect	1	59.54 (59.29, 59.79)	-	-
	Social Activity Aspect	1	69.53 (69.16, 69.90)	-	-
PHG-2	Total	2	22.63 (-2.38, 47.64)	<0.0001	99.9
	Physical Aspect	1	16.43 (15.60, 17.26)	-	-
	Social Activity Aspect	1	16.04 (15.30, 16.78)	-	-
	Emotion Aspect	1	9.84 (9.13, 10.55)	-	-
IDQOL-BCI	Total	1	3.40 (3.31, 3.49)	-	-
	Mental Aspect	2	11.82 (11.36, 12.29)	0.690	0
	Social Activity Aspect	2	11.82 (11.36, 12.29)	0.690	0

**Table 3: The QOL of diabetic patients in Iran in three levels (good, fair, and poor)**

Questionnaire	Subgroups	Number of study	The QOL in diabetic patients (95%CI)	P	I <sup>2</sup> (%)
SF-36	Good	3	15 (-2, 32)	<0.0001	100
	Fair	3	68 (53, 83)	<0.0001	100
	Poor	3	46 (0, 92)	<0.0001	100
SF-20	Good	3	29 (14, 44)	<0.0001	100
	Fair	3	35 (30, 39)	<0.0001	99.5
	Poor	3	36 (32, 41)	<0.0001	99.5
QOL	Good	2	36 (24, 47)	<0.0001	100
	Fair	1	29 (29, 30)	-	-
	Poor	2	45 (20, 71)	<0.0001	100
WHOQOL	Good	1	55 (55, 55)	-	-
	Fair	1	56 (55, 56)	-	-
	Poor	1	37 (37, 37)	-	-
SWED-QUAL	Good	2	62 (19, 105)	<0.0001	100
	Poor	2	38 (-5, 81)	<0.0001	100
IRDQOL	Good	1	11 (11, 11)	-	-
	Fair	1	23 (22, 23)	-	-
	Poor	1	66 (66, 66)	-	-

in QOL, 129.43 in D-39, 34.36 in PedsQL, 41.76 in ADDQOL7, 22.63 in IDQOL-BCI8, 3.40 in DQOL-BCI, 0.62 in EQ-5D, 61.00 in PHG-2, 105.92 in IRDQOL, 59.19 in SWED-QUAL.

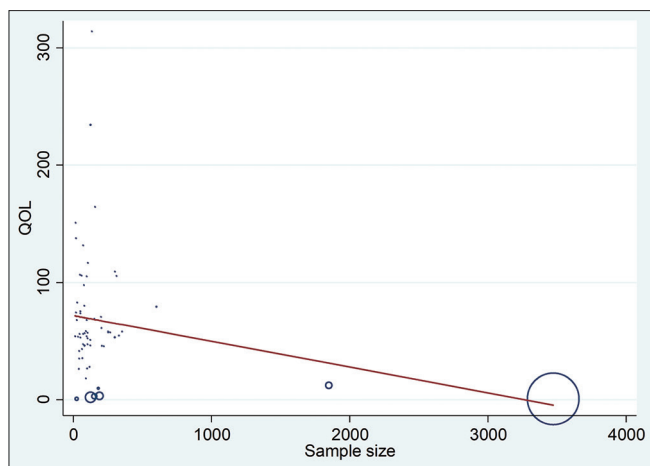
So far, several meta-analyses have been conducted on the status of QOL in diabetic patients in Iran, which we will examine below: In a meta-analysis of T. Schram *et al.* (2009)<sup>[114]</sup> in The Netherlands, the aim was to investigate the relationship between depression and quality of life in diabetic patients. All studies suggest a negative association between depressive symptoms and at least

one aspect of QOL in people with diabetes. People with diabetes with depressive symptoms also had a much lower QOL than diabetes.

1. In meta-analysis of Kiadaliri *et al.* (2013)<sup>[115]</sup> 46 studies found that people with diabetes were less likely to have health-related quality of life (HRQoL) without diabetes. The study covered 20 of Iran's 30 provinces. Of these 46 studies, 5 were type 1 diabetes and 23 were type 2 diabetes, and other studies were a combination of different types of diabetes. However, our study covered the studies published until 2017, and therefore the number of studies studied in our study is about twice that of the 2013 meta-analysis. In 2016, Soleimannejad *et al.*<sup>[20]</sup> Studied the QOL of diabetic patients in 10 studies. And we decided

7 Audit of Diabetes Dependent Quality of Life

8 Iranian version of the Diabetes Quality of Life Brief Clinical Inventory



**Figure 2: The relationship between quality of life score in diabetic patients and the sample size**

to update this study: In the previous meta-analysis the number of studies studied was 10, whereas in the present study 82 studies were reviewed.

- In previous meta-analysis, only studies using questionnaires SF-36 and SF-20 were evaluated. However, in the present meta-analysis, all available questionnaires (WHOQOL-BREF, SF-36, SF-20, DQOL, QOL, PedsQL, ADDQoL, Youth Diabetes QOL and IDQOL-BCI) have been reviewed and no restrictions have been imposed on the questionnaire.
- The number of samples studied in the previous meta-analysis was 1,082, while in the present study 15,571 diabetic patients were evaluated.
- In the present meta-analysis, the QOL score of diabetic patients was examined by type of questionnaire and by dimensions of questionnaires and compared with each other, whereas this was not the case in previous meta-analysis.
- Current meta-analysis covers studies published as of December 31, 2016, while previous meta-analysis has carried out resource search for year 2015
- Current meta-analysis, in addition to the databases used by the previous meta-analysis, it has also examined the Cochrane, Embase, and Medline databases. Given the above, the present study is more complete than the previous meta-analysis study.
- In the present meta-analysis, the QOL of diabetic patients was evaluated in the form of levels: Good, Moderate, and Poor. This issue was not presented in previous meta-analysis.

Recently, two meta-analysis has been published in this regard, which we refer to: In meta-analysis Mokhtari *et al.* (2018)<sup>[116]</sup> of 5,472 samples, the mean physical dimension score in patients with type 2 diabetes (53.5, 95% CI: 43.1–63.9) and the mean mental dimension score (54.5, 95% CI: 47–61.9) was less. As the age of the samples increased, the mean HRQoL score in diabetic patients in Iran decreased significantly.

In a meta-analysis of Dehvan *et al.* 2019,<sup>[117]</sup> the QOL of type 2 diabetes patients in Iran was examined. The mean QOL of patients with type 2 diabetes was 61.90 (95% CI: 54.40–69.40). The highest and lowest QOL was achieved in terms of social support (49.19) and mental health (42.96). In this study, the WHOQOL-BREF questionnaire was used to assess the QOL of diabetic patients and therefore the number of studies studied was limited (16 studies). However, in our study, we did not have any restrictions on the type of diabetes or the type of questionnaire. A meta-analysis of Khunkaew *et al.* (2018),<sup>[118]</sup> 12 studies in Australia found this conclusion. Overall, the HRQOL of participants in the studies was poor on four of eight subscales in the SF-36: Physical functioning (42.75); role physical (20.61); general health (39.52); and vitality (45.73). The results of this study are almost consistent with the results of the present meta-analysis.<sup>[113–116]</sup>

Thommasen *et al.* conducted a study on the people of China, Malaysia, and India. In China, the mean scores of physical functioning was 83.3, public health was 69.3, social functioning was 83.9, and mental health was 72.9. In Malaysia, the mean scores of physical functioning was 86.6, public health was 68.6, social functioning was 78.8, and mental health was 75. In India, the mean scores of physical functioning was 73.9, public health was 70.1, social functioning was 86.1, and mental health was 71.5.<sup>[119]</sup>

QOL<sup>[1,118,119]</sup> Given that varied data have been archived for QOL of diabetic patients, the present meta-analysis was used to obtain an accurate estimate of the QOL of diabetic patients.

## Conclusions

In this study, the QOL of diabetic patients was evaluated according to different types of studied questionnaires. We found that QOL of diabetic patients was lower than normal society. According to the results, the highest and lowest mean QOL score in diabetic patients in Iran were related to the D-39 questionnaire (129.43) and the EQ-5D questionnaires (0.62), respectively.

## Limitations of the study

The limitations of the present study include lack of access to the full text of articles, lack of sufficient data in some articles, lack of reference to mean and standard deviation of QOL score in diabetic patients in some studies, and lack of uniform distribution of studies in different regions of Iran.

## Authors' contribution

MF, MR, MA and DS searched the literature and analyzed the papers. The extraction stage was performed by MR, MA and DS. DS, MF, AHD prepared the manuscript. All authors read and signed the final paper.



## Supplement

## S1: Abbreviated table

Full name	Abbreviated name
Quality of life	QOL
WHO Quality of Life-BREF	WHOQOL-BREF
Short Form-36	SF-36
Short Form-20	SF-20
Diabetes Quality of Life	DQOL
Quality of Life	QOL
The World Health Organization Quality of Life	WHOQOL
Pediatric Quality of Life Inventory	PedsQL
Audit of Diabetes Dependent Quality of Life	ADDQoL
Iranian version of the Diabetes Quality of Life Brief Clinical Inventory	IDQOL-BCI

## 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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