

# Global Quality of Life in HIV/AIDS Patients: A Systematic Review and Meta-Analysis

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## Abstract

**Background:** Acquired immunodeficiency syndrome (AIDS) caused by the human immunodeficiency virus (HIV) is known as one of the most chronic conditions, having significant effects on physical and mental health status in infected individuals, and thus reducing their quality of life (QoL).

**Methods:** In this systematic review, the data were initially collected from the databases of Scopus, PubMed, Embase, Web of Science, and Google Scholar from January 2000 to September 2020 based on the inclusion and exclusion criteria of the study. The data were then analyzed by using the R software.

**Results:** A total number of 25 research articles addressing the QoL in 5,952 HIV/AIDS patients were evaluated using three valid questionnaires, including the Medical Outcomes Study HIV Health Survey (MOS-HIV), the 36-Item Short Form Health Survey (SF-36), and the World Health Organization Quality of Life in HIV-Infected Persons (WHOQoL-HIV). Based on the MOS-HIV, the SF-36, and the WHOQoL-HIV questionnaires, the QoL mean scores in HIV/AIDS patients were 51.80 (49.4-54.57), 54.81 (52.68-56.93), and 13.62 (11.97-15.26), respectively. In addition, the physical items gained a higher mean score than the mental ones in all the questionnaires. The QoL showed higher mean scores in the SF-36 and the WHOQoL-HIV questionnaires in Africa, except for the MOS-HIV questionnaire, which had the highest mean score in North America.

**Conclusion:** Overall, the QoL in HIV/AIDS patients in this study was acceptable, even though further changes and studies are still required to support the findings.

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**Keywords:** Acquired immunodeficiency syndrome, Human immunodeficiency virus, Meta-analysis, Quality of life, Systematic review

## Introduction

The spread of some diseases overwhelms human societies in preventing, controlling, and treating these emerging and established conditions. These problems have not only many adverse socio-economic and cultural effects<sup>1</sup> but also devastating impacts on the physical and

mental health of patients, which in turn double the burden of the problems for the patients and their surrounding environment and leave irreparable consequences for the society and the health system of different countries. Acquired immunodeficiency syndrome (AIDS) is one of the diseases associated with many psychological and physical effects on infected people, as well as developing

compromised immune systems in the human body, creating many socio-cultural problems and imposing high costs on healthcare providers.<sup>2</sup> According to a report by the World Health Organization (WHO) in late 2017, 36.9 million people were infected with human immunodeficiency virus (HIV).<sup>2</sup> Research shows over 60% of the world's HIV-infected population lives in Sub-Saharan Africa.<sup>3</sup> Even though the incidence rate of new infectious cases is stabilizing in many African countries, the number of people living with HIV/AIDS is increasing, which is a serious concern.<sup>4</sup> According to many studies, most HIV-infected patients experience more anxiety, depression, hopelessness, and physical problems than normal people, especially those hospitalized for HIV complications; therefore, this disease negatively affects the quality of life (QoL or QOL) of these people.<sup>5</sup>

In general, the QoL is a subjective perception of one's position in daily life, which assesses health or lack thereof.<sup>6</sup> Therefore, it includes all the mental, social, physical, and psychological aspects of a person's life. In a healthcare system, health-related quality of life (HRQoL) assesses how the person's well-being may be influenced over time by an illness, disability, or disorder.<sup>7</sup>

Different questionnaires are used to assess QoL in HIV-infected patients, the most valid of which are SF-36, WHOQOL-HIV BREF, and MOS-HIV scale. These questionnaires provide criteria for the fitness of these patients and the physical and psychological limitations, including physical health, pain, mental health, health distress and fatigue, and other disturbing indicators imposed on them.<sup>8</sup>

These factors, such as imposing huge costs on the patient, family, and healthcare system, disrupting patients' communication with others, lifestyle changes, severe social constraints, and sometimes communication restrictions on these patients, make the patients' lives and conditions more difficult.<sup>9</sup> This issue justifies the importance of conducting a comprehensive study on the QoL of these patients. Although different studies have examined the QoL in people with AIDS, the results of those studies differ in various regions, cultures, and healthcare systems, implying the need for an integrated review study.<sup>10</sup>

Therefore, lowering QoL in AIDS patients can harm patients and those around them. Thus, promoting QoL in these patients should be a key goal for policymakers and legislators. This study aimed to determine the score of QoL in HIV-infected patients on a global scale, and this information can help prevent potential harm to these patients and improve their QoL. This SLR is the first time conducted so far; policymakers need accurate and comprehensive information to improve the lives of patients with AIDS, create greater well-being, and minimize their physical and psychological constraints. This globally integrated review seeks to provide valuable

and accurate findings to take effective measures to improve the QoL in patients with AIDS.

## Methods

### *The Process of Registration*

Registration in the international Prospective Register of Systematic Reviews (PROSPERO) was carried out for the present systematic review, available at: [https://www.crd.york.ac.uk/prospero/display\\_record.php?ID=CRD42020210268](https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42020210268).

### *The Process of Search*

A search process of the current systematic review was initially performed for the original English articles published on electronic databases from 2000 to September 2020, including Web of Science, PubMed, Scopus, Google Scholar, and Embase. The main keywords during the search strategy were The MeSh terms of "HIV and AIDS", also the MeSh terms of "Quality of life" and the main search strategy was "((((((Life Quality[Title/Abstract]) OR (Health-Related Quality Of Life[Title/Abstract])) OR (Health Related Quality Of Life[Title/Abstract])) OR (HRQOL[Title/Abstract])) OR (Quality of Life[Title/Abstract])) AND (((((((((((((((Human Immunodeficiency Virus[Title/Abstract]) OR (Human Immunodeficiency Viruses[Title/Abstract])) OR (Human T Cell Lymphotropic Virus Type III[Title/Abstract])) OR (Human T-Cell Lymphotropic Virus Type III[Title/Abstract])) OR (Human T-Cell Leukemia Virus Type III[Title/Abstract])) OR (Human T Cell Leukemia Virus Type III[Title/Abstract])) OR (LAV-HTLV-III[Title/Abstract])) OR (Lymphadenopathy-Associated Virus[Title/Abstract])) OR (Lymphadenopathy Associated Virus[Title/Abstract])) OR (Lymphadenopathy-Associated Viruses[Title/Abstract])) OR (Human T Lymphotropic Virus Type III[Title/Abstract])) OR (Human T-Lymphotropic Virus Type III[Title/Abstract])) OR (AIDS Virus[Title/Abstract])) OR (AIDS Viruses[Title/Abstract])) OR (Acquired Immune Deficiency Syndrome Virus[Title/Abstract])) OR (Acquired Immunodeficiency Syndrome Virus[Title/Abstract])) OR (HTLV-III[Title/Abstract]))" which had been found from PubMed and the keywords of related previous articles. The initial search yielded 567 relevant articles and five related articles from Google Scholar. Evaluating global QoL among HIV-infected patients in the present century has led us to review articles from 2000 onwards. As shown in Figure 1, the EndNote software was used to delete the duplicates. Since MOS-HIV, WHOQOL-HIV BREF, and SF-36 questionnaires are reportedly the most valid HRQoL measurement scales among HIV-infected patients, only the studies conducted with these questionnaires were included and analyzed in this systematic review.

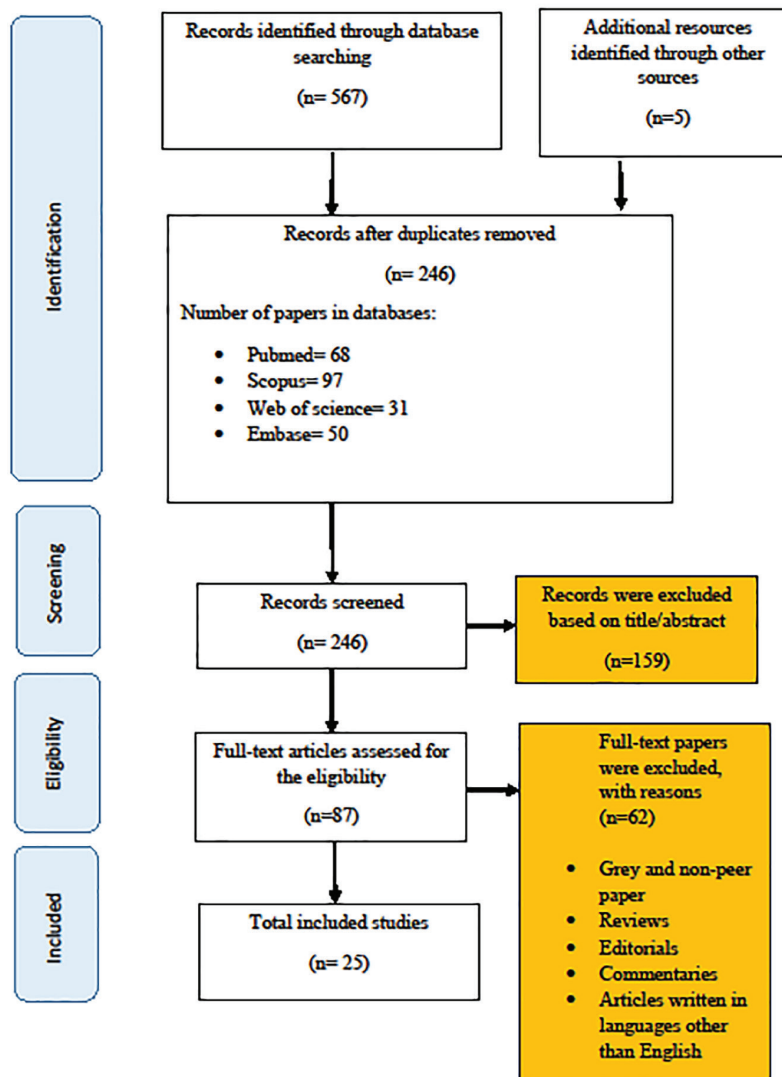


Figure 1: Flow diagram of our review process (PRISMA)

### Instruments Used for Data Collection

The analysis in this review was performed on the articles employing MOS-HIV, WHOQOL-HIV BREF, and SF-36 tools. The 36-item Short Form Health Survey (SF-36) is one of the most extensively applied scales to measure generic HRQoL, scored on a range of 0 to 100, indicating the lowest and highest possible scores, respectively. The WHOQOL-HIV-BREF is a short version of the World Health Organization Quality of Life instrument specifically designed for individuals with HIV. It assesses four key dimensions of quality of life: social relationships, psychological health, physical health, and environment. Additionally, it includes an Overall Quality of Life and General Health facet, with each of the six domain scores ranging from 4 (indicating the lowest quality of life) to 20 (representing the highest quality of life). The 31-item Medical Outcomes Study HIV Health Survey (MOS-HIV) is a concise yet comprehensive tool for assessing HRQoL in individuals with HIV. It is an adaptation of the MOS-Short Form 20, which

is widely utilized in the context of HIV/AIDS. The subscales within the MOS-HIV are scored on a scale from 0 to 100, where higher scores indicate a better-perceived state of health.

### Selection of Screened Articles

Two reviewers independently reviewed the title and abstract of screened articles to delete irrelevant studies in accordance with inclusion and exclusion criteria, resulting in 45 relevant investigations. Then, the full texts of the selected articles were studied, resulting in 25 eligible articles, as shown in Figure 1.

### Inclusion Criteria

The analysis included original English articles with full text from January 2000 to September 2020. These articles employed the MOS-HIV, WHOQOL-HIV BREF, and SF-36 scales to measure Quality of Life (QoL) among HIV-infected patients. Additionally, the included articles applied various study designs, including case-study, case studies,

cross-sectional, prospective, descriptive, and cohort observational designs.

#### *Exclusion Criteria*

The study excluded non-English articles published before January 2000. Articles with the following study designs were excluded: randomized controlled trials, theses, case-control studies, commentaries, book chapters, books, editorials, expert opinions, letters to the editor, brief reports, and reviews. Articles that primarily evaluated therapeutic strategies, impacts, effects, follow-up, clinical decision-making, and drug-related aspects were excluded. Furthermore, the analysis did not include studies that reported unreliable figures or tables or contained incorrect calculations related to Quality of Life (QoL).

#### *Assessing the Quality of Articles Selected in the Final Analysis*

The Newcastle-Ottawa scale (NOS) was performed for the overall quality assessment of all included observational studies. Two reviewers independently evaluated the quality of the articles to avoid the risk of bias, and any discrepancy was judged by a third reviewer.

The Cochrane Collaboration's Newcastle-Ottawa Scale (NOS) was used to assess the methodological quality of cohort and case-control studies in systematic reviews. This scale assigns a maximum of 9 points for the minimum risk of bias across three domains:

1. Ascertainment of exposure/outcomes (3 points)
2. Comparability of groups (2 points)
3. Selection of study groups (4 points)

The quality of the articles was categorized as follows:

- Good quality: Achieving 2 or 3 points in the outcome/exposure domain, 1 or 2 points in the comparability domain, and 3 or 4 points in the selection domain.

- Fair quality: Obtaining 2 or 3 points in the outcome/exposure domain, 1 or 2 points in the comparability domain, and 2 points in the selection domain.

- Poor quality: Obtaining 0 or 1 point in the outcome/exposure domain, 0 points in the comparability domain, and 0 or 1 point in the selection domain.<sup>11</sup>

#### *Extraction of Data Required in the Final Analysis*

The required data was extracted and recorded in a pre-designed form, including place of study, name of authors, quality of the study, mental quality of life, physical quality of life, and the instruments for data collection (MOS-HIV, WHOQOL-HIV BREF, and SF-36 scales and others).

#### *Statistical Analysis of the Obtained Data*

The random-effects model meta-analysis computed the means using the DerSimonian-Laird (DL) estimator. The results were presented on a forest plot at a 95% confidence interval (95% CI). Two publication date and sample size parameters were selected to evaluate the heterogeneity ( $I^2$ ) among the included articles and meta-regression analysis. The sensitivity test was used to confirm the result's stability. Subgroup analyses were conducted considering various parameters, including sample size, study location, and the specific domains of the MOS-HIV, WHOQOL-HIV BREF, SF-36 scales, and other instruments. A cumulative meta-analysis was also performed on questionnaire domain continents and WHO regions. Egger's regression test detected the publication bias. Comprehensive Meta-analysis (CMA) software was chosen for all collected data analysis.

## Results

#### *Total Meta-analysis by Measurement Instruments*

Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines were employed to report the findings of this review.<sup>12</sup> The initial search yielded 572 articles from four authentic databases and additional sources. The deletion of duplicates resulted in 246 articles. Subsequently, 152 articles were deleted after the review of abstracts and full texts, resulting in 87 articles. After reviewing the remaining articles, 62 were deleted for other reasons, such as gray studies, inappropriate studies, other languages, etc. Finally, 25 articles (5952 participants), published from January 2000 to September 2020, were selected for final analysis according to the inclusion and exclusion criteria (Figure 1 and Table 1).

The HIV-QOL score was 51.80 (49.4-54.57) (Z-value: 36.76,  $I^2=85.66%$ ,  $P<0.0001$ ) based on MOS-HIV scale, 54.81 (52.68-56.93) (Z-value: 50.51,  $I^2=95.21%$ ,  $P<0.0001$ ) on SF-36 scale, and 13.62 (11.97-15.26) (Z-value: 16.25,  $I^2=89.34%$ ,  $P<0.0001$ ) on WHOQOL-HIV scale (Figure 2).

#### *Meta-analysis by Continent based on Questionnaires*

The analysis by continent based on the MOS-HIV QOL questionnaire showed that the HIV-QOL score had the lowest value of 48.55 (29.92-67.18) (Z-value: 5.1,  $I^2=99.2%$ ,  $P<0.0001$ ) in Asia and the highest value of 55.75 (46.09-65.40) (Z-value: 11.3,  $I^2=99.31%$ ,  $P<0.0001$ ) in North America.

In addition, the HIV-QOL score based on the SF-36 QoL questionnaire was the highest at 80.40 (-63.23-97.57) (Z-value: 13.21,  $I^2=93.9$ ,  $P<0.0001$ ) in Africa, and the lowest at 46.49 (37.50-55.47) (Z-value: 10.14,  $I^2=99.48%$ ,  $P<0.0001$ ) in North America.



Table 1: The summary of included studies

First Author	Year of Publication	Country	Continent	WHO regions	Total Sample	Number of males	Number of females	Age (mean)	Age (SD)	Physical QOL (mean)	Physical QOL (SD)	Mental (mean)	Mental (SD)	Tools	Quality of Study
Akinboro et al.	2014	Nigeria	Africa	AFRO	491	144	347	38.5	9.7	16.58	2.79	16.23	2.6	WHOQOL-HIV	High
Alemayehu et al.	2017	Ethiopia	Africa	AFRO	465	178	287	39	8.1	17.43	2.8	12.6	3.4	WHOQOL-HIV	High
Au et al.	2004	China	Asia	WPRO	55	48	7	39.42	9.79	88.58	16.21	69.09	20.92	SF-36	High
Zhakipbayeva et al.	2019	Kazakhstan	Europe	EURO	531	294	237	42	8.7	15.49	2.66	13.57	2.07	WHOQOL-HIV	High
Barger et al.	2020	France	Europe	EURO	586	430	156	45	9.6	14.15	2.97	13.7	2.78	WHOQOL-HIV	High
Bastardo et al.	2000	Venezuela	South America	PAHO	118	103	15	36	10.63	76.72	27.54	66.12	20.56	SF-36	High
Suleiman et al.	2020	Nigeria	Africa	AFRO	353	114	239	39.5	8.4	13.3	2.6	13.9	2.4	WHOQOL-HIV	High
Atkinson et al.	2011	China	Asia	WPRO	203	124	79	40.2	6.4	48.3	9.7	48.8	9.9	MOS-HIV	High
Henderson et al.	2012	United States	North America	PAHO	305	206	99	41.51	8.29	43.47	11.28	46.77	12.24	MOS-HIV	High
Cowdery et al.	2002	United States	North America	PAHO	82	0	82	37.5	9.3	70.02	33.66	59.76	43.35	MOS-HIV	High
Delate et al.	2001	United States	North America	PAHO	242	207	35	39.8	8.4	63.7	29.2	44.9	45.5	MOS-HIV	High
Henderson et al.	2010	United States	North America	PAHO	306	206	99	41.51	8.29	68.49	29.1	52.19	46.3	MOS-HIV	Medium
Eriksson et al.	2000	Sweden	Europe	EURO	72	72	0	37	9	78.7	31	79.4	30.4	Other	Medium
Fleming et al.	2004	United States	North America	PAHO	53	41	12	44	9.8	56.6	46	58.5	46.6	SF-36	High
Imam et al.	2011	Bangladesh	Asia	SEARO	82	47	35	34.83	7.41	12.41	3.03	11.63	2.62	WHOQOL-HIV	High
Jenevivi et al.	2019	Nigeria	Africa	AFRO	80	30	50	44.74	9.6	77.76	25.81	89.06	19.51	Other	Low
Mahalakshmy, et al.	2011	India	Asia	SEARO	200	101	99	35	8.6	13	4.5	12.7	4	WHOQOL-HIV	Medium
Melaku et al.	2020	Ethiopia	Africa	AFRO	160	59	101	41.47	9.45	77.58	15.11	58.32	7.79	Other	Low
Odek et al.	2014	South Africa	Africa	AFRO	554	251	303	46	10.1	84.4	24.97	76.4	28.4	SF-36	High
Pokhrel et al.	2019	United States	North America	PAHO	24	NG	NG	62.9	7	49.2	10.3	44.4	8.4	SF-36	High
Proeschold-Bell et al.	2010	United States	North America	PAHO	251	142	109	42.4	7.7	42.9	NG	38.9	NG	SF-36	High
Pumpanich et al.	2010	Thailand	Asia	SEARO	292	160	132	10.9	2.27	75.8	15.6	77.4	18.7	Other	High
Tsui et al.	2006	United States	North America	PAHO	216	179	37	41	8.5	46	9	43	12	SF-36	Medium
Yen et al.	2015	Taiwan	Asia	WPRO	145	NG	NG	40.1	9.1	13.2	2.3	11.8	2.6	WHOQOL-HIV	Low
Santos et al.	2017	Brazil	South America	PAHO	86	60	26	44.6	15.4	11.4	2.8	11.9	2.6	WHOQOL-HIV	High

WHO (World Health Organization), AFRO (African Region Organization), AMRO (Region of the Americas Organization), SEARO (South-East Asian Region Organization), EURO (European Region Organization), WPRO (Western Pacific Region Organization), MOS-HIV (Medical Outcome Study-HIV), SF-36 (Short Form Survey 36), WHOQOL-HIV (World Health Organization - HIV)

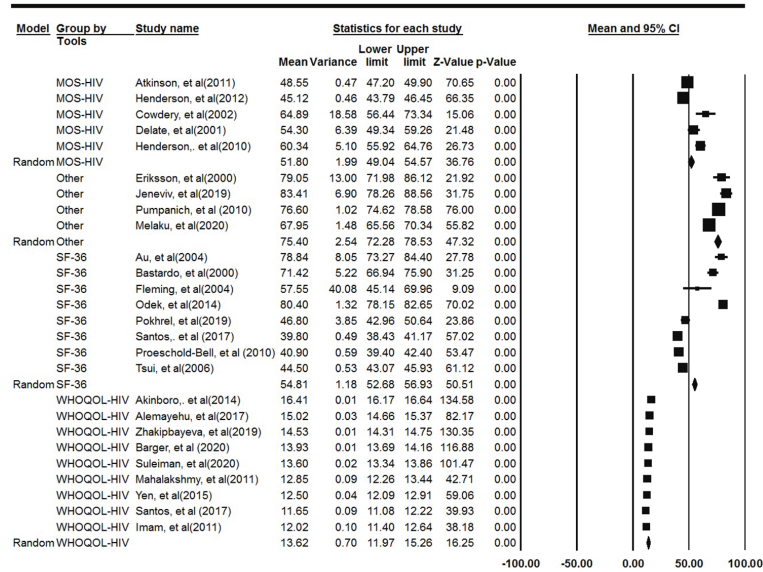


Figure 2: Meta-analysis based on questionnaires

Table 2: Meta-analysis based on Continent and WHO regions

Questionnaires	Groups		Effect size and 95% confidence interval				Test of null (2-Tail)	
			Pooled mean	SD	Lower limit	Upper limit	Z-value	P-value
MOS-HIV QOL	Continent	Asia	48.55	9.50	29.92	67.18	5.11	<0.001
		North America	55.75	4.93	46.09	65.40	11.32	<0.001
	WHO	AMRO	55.75	4.93	46.09	65.40	11.32	<0.001
		WPRO	48.55	9.50	29.92	67.18	5.11	<0.001
	TOTAL	Random effects	53.42	2.42	48.68	58.16	22.09	<0.001
SF-36	Continent	Africa	80.40	8.76	63.23	97.57		<0.001
		Asia	78.84	9.14	60.93	96.74		<0.001
		North America	46.49	4.58	37.50	55.47	10.14	<0.001
		South America	55.13	6.25	42.88	67.39		<0.001
	WHO	AFRO	80.40	6.72	67.22	93.58	11.96	<0.001
		AMRO	49.18	2.88	43.54	54.82	17.09	<0.001
		WPRO	78.84	7.21	64.71	92.96	10.94	<0.001
TOTAL	Random effects	57.41	5.49	46.65	68.18	10.45	<0.001	
WHOQOL-HIV	Continent	Africa	15.01	0.66	13.72	16.29	22.89	<0.001
		Asia	12.46	0.67	11.15	13.77	18.60	<0.001
		Europe	14.23	0.80	12.66	15.80	17.78	<0.001
		South America	11.65	1.16	9.37	13.93	10.02	<0.001
	WHO Region	AFRO	15.01	0.69	13.66	16.35	21.91	<0.001
		EURO	14.23	0.84	12.59	15.87	17.01	<0.001
		AMRO	11.65	1.21	9.27	14.03	9.60	<0.001
		SEARO	12.44	0.86	10.75	14.12	14.45	<0.001
		WPRO	12.50	1.20	10.16	14.84	10.45	<0.001
		Total	Random effects	13.63	0.47	12.71	14.54	29.18

WHO (World Health Organization), AFRO (African Region Organization), AMRO (Region of the Americas Organization), SEARO (South-East Asian Region Organization), EURO (European Region Organization), WPRO (Western Pacific Region Organization); MOS-HIV (Medical Outcome Study-HIV), SF-36 (Short Form Survey 36), WHOQOL-HIV (World Health Organization - HIV)

Moreover, the HIV-QOL based on the WHOQOL-HIV questionnaire had the lowest value of 11.65 (9.37-13.93) (Z-value: 10.01, I<sup>2</sup>=98.9%, P<0.0001) in South America and the highest value of 15.01 (13.72-16.29) (Z-value: 22.8, I<sup>2</sup>=98.9%, P<0.0001) in Africa (Table 2).

Meta-analysis by WHO Based on Questionnaires

According to the results of the analysis by the WHO

regions based on the MOS-HIV QOL questionnaire, the highest score of HIV-QOL was related to AMRO region, 55.75 (46.09-65.40) (Z-value: 11.3, I<sup>2</sup>=98.77%, P<0.0001) and the lowest score was related to WPRO region, 48.55 (29.92-67.18) (Z-value: 5.1, I<sup>2</sup>=92.36%, P<0.0001).

Based on the SF-36 questionnaire, the highest score of HIV-QOL was related to AFRO region, 80.40

(67.22-93.58) (Z-value: 11.95, I<sup>2</sup>=97.9%, P<0.0001), and the lowest score was related to AMRO region, 49.18 (43.54-54.82) (Z-value: 17.08, I<sup>2</sup>=93.9%, P<0.0001).

Based on the WHOQOL-HIV questionnaire, the HIV-QOL scores in AMRO and AFRO regions were the lowest at 11.65 (9.27-14.03) (Z-value: 9.6, I<sup>2</sup>=98.8%, P<0.0001) and the highest at 15.01 (13.66-16.35) (Z-value: 21.9, I<sup>2</sup>=98.8%, P<0.0001), respectively (Table 2).

*Meta-analysis by Questionnaire Domain*

The findings showed that, based on the tools' domain, the items of MOS-HIV had almost the same score, which were very close together. However, social

function had the highest score. In the SF-36, the item of physical function was the highest by 70.5 (61.3-79.7) (Z-value: 15.04, I<sup>2</sup>=98.83%, P<0.0001). On the other hand, in the analysis based on WHOQOL-HIV, the items indicated the same scores (Table 3).

*Meta-analysis Based on Quality Assessment Tools*

Findings showed that, among all included studies, 19 had high quality, and medium and low studies were four and three, respectively. (Table 1)

*Publication Bias*

According to Figure 3, the results of Egger's statistical test showed a P-value (2-tailed) of 0.88, affirming the existence of no publication bias in the study.

**Table 3:** A meta-analysis based on questionnaire items

Questionnaires	Groups	Effect size and 95% confidence interval					Test of null (2-Tail)		Heterogeneity	
		Number Studies	Point estimate	Standard error	Lower limit	Upper limit	Z-value	P-value	P-value	I-squared
MOS-HIV	Cognitive function	6	53.29	5.28	42.94	63.64	10.09	<0.001	<0.001	98.96
	Energy/Fatigue	6	54.99	5.28	44.64	65.34	10.42	<0.001	<0.001	99.14
	General Health	6	51.49	5.30	41.10	61.88	9.71	<0.001	<0.001	93.43
	Health distress	6	57.22	5.29	46.86	67.58	10.82	<0.001	<0.001	98.99
	Mental health	6	54.67	5.27	44.34	65.00	10.37	<0.001	<0.001	99.00
	Mental health summary	6	50.56	5.25	40.27	60.86	9.62	<0.001	<0.001	90.01
	Pain	6	53.70	5.30	43.31	64.09	10.13	<0.001	<0.001	98.45
	Physical function	6	58.52	5.28	48.16	68.87	11.08	<0.001	<0.001	99.48
	Physical health summary	6	44.66	5.25	34.38	54.94	8.51	<0.001	<0.001	92.37
	Quality of life	6	57.54	5.27	47.22	67.86	10.92	<0.001	<0.001	98.00
	Role function	6	47.53	5.34	37.05	58.00	8.89	<0.001	<0.001	93.98
SF-36	Social function	6	66.74	5.29	56.38	77.10	12.62	<0.001	<0.001	99.28
	Bodily pain	8	61.14	4.70	51.93	70.35	13.01	<0.001	<0.001	98.68
	General Health	8	56.49	4.67	47.34	65.65	12.09	<0.001	<0.001	99.00
	Mental Component Summary(MCS)	8	47.10	4.65	37.98	56.22	10.12	<0.001	<0.001	93.53
	Mental health	8	60.94	4.68	51.77	70.11	13.02	<0.001	<0.001	97.74
	Physical component summary(PCS)	8	53.29	4.66	44.16	62.41	11.44	<0.001	<0.001	98.92
	Physical function	8	70.54	4.69	61.35	79.73	15.04	<0.001	<0.001	98.84
	Role limitation, Emotional	8	50.33	4.77	40.98	59.68	10.56	<0.001	<0.001	99.23
	Role limitation, Physical	8	50.19	4.79	40.80	59.57	10.48	<0.001	<0.001	99.32
	Social function	8	66.19	4.71	56.96	75.42	14.06	<0.001	<0.001	98.78
	Vitality	8	53.12	4.69	43.92	62.32	11.32	<0.001	<0.001	95.25
WHOQOL-HIV	Environmental Health	9	13.39	0.51	12.39	14.40	26.13	<0.001	<0.001	99.20
	Level of independence	9	13.94	0.51	12.93	14.94	27.13	<0.001	<0.001	98.32
	Physical health	9	14.16	0.51	13.15	15.17	27.53	<0.001	<0.001	99.28
	Psychological health	9	13.13	0.51	12.12	14.13	25.55	<0.001	<0.001	98.85
	Social relationship	9	13.56	0.51	12.56	14.57	26.36	<0.001	<0.001	98.70
	Spirituality/Religion/Personal beliefs	9	13.70	0.52	12.69	14.71	26.60	<0.001	<0.001	98.78

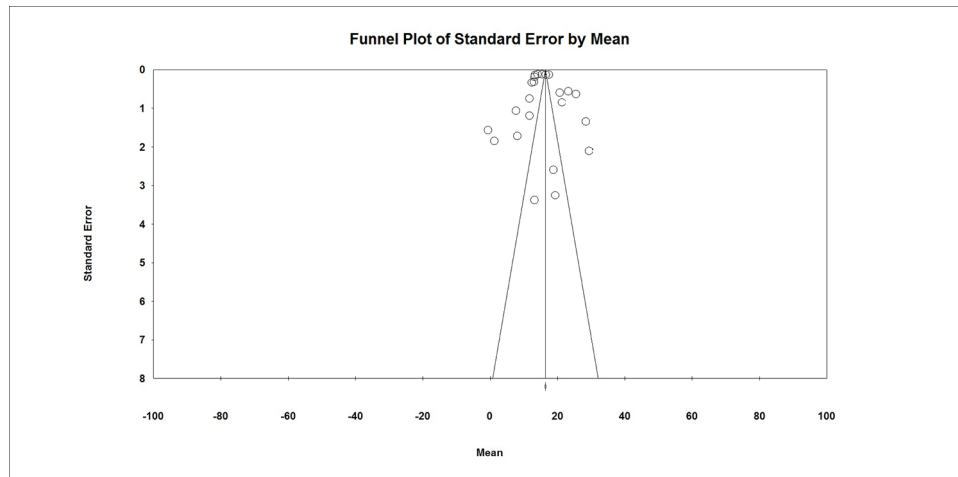


Figure 3: Funnel plot for publication bias.

## Discussion

To our knowledge, this is the first global systematic review and meta-analysis in which the QoL levels in HIV-infected patients were integratively measured based on three valid questionnaires of MOS-HIV, SF-36, and WHOQOL-HIV BREF. According to the analysis, no utility range was defined for these questionnaires and the QoL level of these patients. Therefore, we decided to divide the study results into three categories, considering the results from the questionnaires in this study and questions and answers from experts and those with extensive experience in this field (Figures 4 and 5).

The analysis revealed that the mean HIV-QOL score based on the MOS-HIV questionnaire was 51.80 (49.4-54.57), which was in an acceptable range. According to Maleki (2020) review, the HIV-QOL score in 1576 patients was 49.05.<sup>13</sup> The quality of life (QoL) level in the referenced study is consistent with ours and falls within an acceptable range. In the study conducted by Atkinson (2011), the mean HIV-QOL score was 48.55 (with a range of 47.20 to 49.90), which aligns with our study and falls within the acceptable range.<sup>14</sup>

In our study, the mean HIV-QOL score, as assessed through the SF-36 questionnaire, was 54.81 (with a range of 52.68 to 56.93), falling within the acceptable range. This is consistent with findings from a study by Tsui et al. (2006), where the mean HIV-QOL score was 45, aligning with our results and within the acceptable range. In the Tsui et al. study, the highest and lowest scores were associated with mental health (56.0 with a range of 28.0–80.0) and emotional items.<sup>15</sup>



Figure 4: QOL spectrum in different scores based on the utility of SF-36 and MOS-HIV

However, in a study conducted by Odek (2014), the mean HIV-QOL score was notably higher at 80.40 (with a range of 78.15 to 82.65), which differs from the results of our study and falls into the good range. This study observed that QoL levels were superior in patients with access to personal social networks, likely due to improved mental well-being.<sup>16</sup>

The mean score of HIV QOL based on the WHOQOL-HIV questionnaire in our study was 13.62 (with a range of 11.97 to 15.26), which is in the acceptable range. In a study by Akinboro (2014), the mean HIV-QOL score was 16.41 (with a range of 16.17 to 16.64), within the acceptable range and in line with ours.<sup>17</sup> In this study, married people had better QoL levels. In addition, the QoL was higher in people over the age of 40 years. The two items of Spirituality (with a mean score of 16.93) and Environment (with a mean score of 16.08) had the highest and lowest scores, respectively. In contrast, Physical health (with a mean score of 14.16) had the highest score, and psychological health (with a mean score of 13.13) had the lowest score in our study. In a study by Yen (2015), the mean HIV-QOL score was 12.50 (12.09-12.91), consistent with our study and in the acceptable range.<sup>18</sup> In the referenced study, the highest and lowest scores were found in the Physical (13.2) and Psychological (11.8) items, respectively. These findings are consistent with the results presented in our study.<sup>18</sup>

Analysis of the data by Continent and WHO region, and based on the MOS-HIV questionnaire, showed that the HIV-QOL level was 53.42 (48.68-58.16), within the acceptable range. Accordingly, the AMRO region and North America had the highest HIV-QOL score, 55.75 (46.09-65.40), and

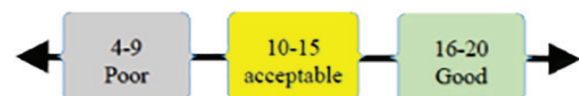


Figure 5: QOL spectrum in different scores based on the utility of WHOQOL-HIV BREF



the WPRO region and Asia had the lowest HIV-QOL score, 48.55 (29.92-67.18); thus, the QoL level in all these regions is within acceptable limits. However, Henderson (2010) in the United States reported that the QoL level in HIV-infected patients was 60.34 (55.92-64.76), in the acceptable range and consistent with our study.<sup>19</sup> Moreover, Atkinson (2011) in China found that this score was 48.55 (47.20-49.90), which was in line with our study and within the acceptable range.<sup>14</sup> The QoL levels can reportedly drop due to factors such as weakness in the healthcare system, the apprehension individuals experience due to the potential scrutiny from their social environment as a result of their ailment, psychological pressure and stress, high treatment costs, and lack of participation in counseling and group therapy.

In our study, the Quality of Life (QoL) levels, as measured by the SF-36 questionnaire, varied by continent and WHO region. Overall, the QoL score for HIV-infected patients was 57.41 (with a range of 46.65 to 68.18), falling within the acceptable range.

Notably, the HIV-QOL had its highest score in the AFRO region (Africa) at 80.40 (with a range of 67.22 to 93.58), indicating a good QoL. Similarly, the AMRO region scored 49.18 (with a range of 43.54 to 54.82), also in the good range. In contrast, North America had the lowest score at 46.49 (with a range of 37.50 to 55.47), which still fell within acceptable limits. Despite being a developing country, South Africa's QoL level remained in the good range at 39.80 (with a range of 38.43 to 41.17), possibly due to relatively favorable living conditions, lower stress, and an acceptable level of national healthcare. These findings align with a study conducted by Patil (2017) in Brazil (South America), where the QoL level was 39.80, also within the acceptable range. As mentioned earlier, depression and anxiety were linked to decreased QoL.<sup>20</sup> It is plausible to suggest that since HIV primarily affects the mental condition of patients rather than their physical and motor abilities, the QoL of these patients does not tend to be poor.

In our study, the QoL levels in HIV-infected patients were generally within acceptable limits. The adverse impacts of infection on the QoL in HIV-infected patients can be reduced through social and psychological support as well as nursing interventions and evaluations like tips on transmitting the virus, ways to treat the disease, and the mechanism of pathological progression. In addition, the government and those in charge can help such patients by freeing or minimizing the healthcare system's cost and reducing the cost of counseling and medication.

#### *Limitations of the Study*

One of the most important limitations of this study was the lack of studies in some countries, leading to a lack of data in some regions, such as EMRO;

therefore, we suggest further studies in these regions in the future. Another limitation was the lack of access to some articles and the unavailability of the full text for some studies. The data collection tools selected in this study included MOS-HIV, WHOQOL-HIV BREF, and SF-36 scales; some studies had insufficient data, and others employed different tools.

On the other hand, the strength of this study is the scale worked on. This study is the first study on a global scale to systematically review the quality of life of these patients in all respects.

#### **Conclusion**

The adverse impacts of HIV infection on the quality of life in these patients might be decreased via social and psychological support as well as nursing interventions and evaluations, including recommendations on viral transmission routes, therapeutic strategies, and the mechanism of pathological progression. In general, the QOL among patients was acceptable, which could be improved by clarifying the determinants of QOL as a key step in marshaling future treatment efforts. Involvement of families, friends, and the whole community in the disease management process can play a key role in enhancing patients' ability to be more socially active and better control their overwhelming stress.

We suggest conducting further research to measure health-related quality of life among patients with late-stage HIV infection and patients with more experience.

**Conflict of Interest:** None declared.

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