

## Quality of Life in the Iranian Mustard Gas Victims; A Meta-Analysis

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### ABSTRACT

**Aims** Following the application of chemical weapons against Iran by Iraq, approximately 100,000 people were affected by chemical weapons. This study aimed to assess the quality of life in mustard gas victims.

**Information & Methods** In this meta-analysis study, PubMed, Scopus, Google Scholar, IranMedex, Magiran, and SID databases were searched until 2019. The extracted data were analyzed by the random-effect model. The heterogeneity of studies was assessed by the I<sup>2</sup> index, and the data is analyzed by STATA 12.1.

**Findings** The average quality of life by SF-36 and SGRQ questionnaires was reported based on seven studies including 1241 victims. SF-36 showed that the Pooled score of the physical component scale is 28.33 (95% CI: 24.02-32.63), whereas the MCS is 35.83 (95% CI: 29.07-42.59). The victims achieved the least score, 21.76 (95% CI: 19.99-23.53) for the physical component in the subscale of Role Function-Physical, and the mental component score in the Role Function-Emotional subscale that is recorded as 31.36 (95% CI: 17.70-45.01). The result from the SGRQ questionnaire showed 66.9 (95% CI: 56.7-77) as the Pooled total average of the quality of life and the symptom subscale recorded 79.05 (95% CI: 68.8-89.3) as the highest score for the chemical victims in Iran.

**Conclusion** The quality of life of chemical weapon victims is very low. These victims possess poor physical and mental components. While they have a better situation in the mental component comparing to the physical.

**Keywords** Quality of Life; Mustard Gas; Iran; Meta-Analysis; Chemical Warfare Agents

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## Introduction

Sulfur mustard, bis (2-chloroethyl) sulfide (SM), as an alkylating agent, has been the most widely used chemical weapon agent (CWA) between 70 different chemical warfare agents [1, 2]. SM is a strong alkylation agent with high absorbance and impact on lungs, eyes and skin. It may also be absorbed through the gastrointestinal tract following consumption of contaminated food. It is one of the major chemical warfare agents developed and used during World War I (1914-1919) [3, 4]. The first usage of SM was in 1917 by the Nazi army against allied forces in Ypres, Belgium [5]. Also, the Egyptian forces used SM in Yemen during World War II (1939-1945) [6]. Nevertheless, the highest unconventional application of SM occurred in the Iran-Iraq war (1980-1988). According to international statistics, more than 100 thousand injured are suffering from this chemical currently [7].

Respiratory tract injury (42.5%), eyes (39.3%), and skin (24.5%) are the most common late complication of SM inhalation [8, 9]. Respiratory tract injury is the most 70% late complication of SM inhalation that causing disability is pulmonary disorders in which the main underlying pathology is Cough, increased sputum, respiratory volume reduction, bronchiolitis obliterans (BO) and chronic obstructive pulmonary disease (COPD) [5, 10, 11].

Quality-of-life (QOL) has many different contexts for different people. Several factors may involve the QOL [12]. General dimensions of quality of life are physical, mental, social and spiritual. Injuries induced by chemical weapons can alter people's QOL and cause chronic and progressive disorders [13]. QOL in SM patients decreased further with obstructive airway disease and decreases during sleep and frequent awakenings and obstructive sleep apnea (OSA) [14, 15]. OSA is a common respiratory disorder during sleep with breathing or shortness of breath during sleep is characterized by frequent and usually takes 20-40 seconds [16-18].

Except for many physical complications caused by CWA, psychological events are more critical. Psychological consequences will lead to the decrease of QOL and may even continue for two generations [19].

Improve patient satisfaction and improve the quality of life in patients with increased respiratory problems exposed to the SM [20].

Based on previous studies, the physical injuries, sleep disorders, drug addiction, having no plans for the future, interfering with everyday life, self-esteem, paranoia, anger, and indifference and meaningless in life, lifestyle changes, depression, invasion, nervousness, confusion, and maladaptive life are direct and indirect SM upon QOL in patients [19-22]. Studies have shown that there is no correlation between the occurrence of pathological findings and QOL in sulfur mustards exposer

patients. Also has been shown to reduce Respiratory tract injury improves sleep and quality of life of SM and COPD patients [23]. In this meta-analysis paper, we document a series of SM clinical findings and the review impact of SM on the QOL of these patients.

## Information and Methods

This meta-analysis was based on the instructions introduced by York University [24], examines the QOL of Iranian chemical gas victims affected by mustard gas in 2019. The texts were available with specific terms and formulas of search searched. To build a formula consulted with two experts specialized in fields of psychology and medical science. The search was done through the Persian and English sources such as IranMedex, Magiran, SID, PubMed, Scopus, and Google Scholar with specific terms and designed search formula until the year 2016. The terms such as "Quality of Life", "Chemical Warfare Agents", "Chemical Warfare", "Chemical veterans", "Chemical weapon", "Chemical injuries", "Mustard" and "Mustard Gas" were searched in Scientific Information Database (SID), IranMedex and Magiran. Also, the manual search had been done through journals like "Iranian Journal of War and Public Health", "Journal of military medicine," and "Journal of Behavioral Sciences". Then the advanced search continued on Google Scholar, Scopus, and PubMed with specific terms. The eligible studies consist of all precise studies related to the QOL of chemical gas victims. Hence other documents such as books, article reviews, and reports were removed as they were not suitable to answer the research question, time limits, and lack of possibility of qualitative assessment. To preserve the neutrality of the research and reduce the possible errors in data gathering in the research, the topics and abstracts were assessed by two researchers, and the studies that did not have the research criteria were removed.

The data was extracted based on the standard form designed previously for gathering them. This form was designed by the research group, including items such as writer's name, the topic of the study, year of publish, name of the journal, criteria of input and output number of sample, and type of questionnaires. The remained studies had been retrieved and were scrutinized to be eligible by the research group. Full texts were not masked to the author or publication. The Discrepancies were solved by the third researcher. The articles were assessed according to the evaluating checklist by the National Institutes of Health (NIH) [25]. This checklist includes 14 criteria to evaluate the articles based on qualitative standards; the checklist had been designed based on a selective strategy of York University by our planning and executive team. In the assessment phase, the articles within a minimum of 60% of the total score were chosen for the

analysis. The questionnaires that used in the research are Medical Outcome Study Short Form-36 (SF-36) and St. George's Respiratory Questionnaire (SGRQ) [26-31].

After the systematic review of the texts, based on the question of the research and the criteria designed in the qualitative checklist, 21 articles were chosen. Fourteen of them were removed from the studies (five were removed due to unreasonable methods and lack of enough information, nine were removed as they did not have the minimum score from the checklist); at the end, seven articles [34-40] remained with the qualitative assessment provided before and

chosen for the analysis (Figure 1). In the results, the articles [34-40] were named A1 to A7, respectively. We contacted the writers of the three articles [35, 36, 39] for more information because of justification and further explanation for their outputs and inputs and how the articles were studied. Also, some Persian articles in this field did not have the necessary writing qualifications and were reported unclear.

Simotinosly the results were imported on EndNote X7 software. The number of studies was too small to assess publication bias reliably; all analyses were conducted using STATA 12.1.

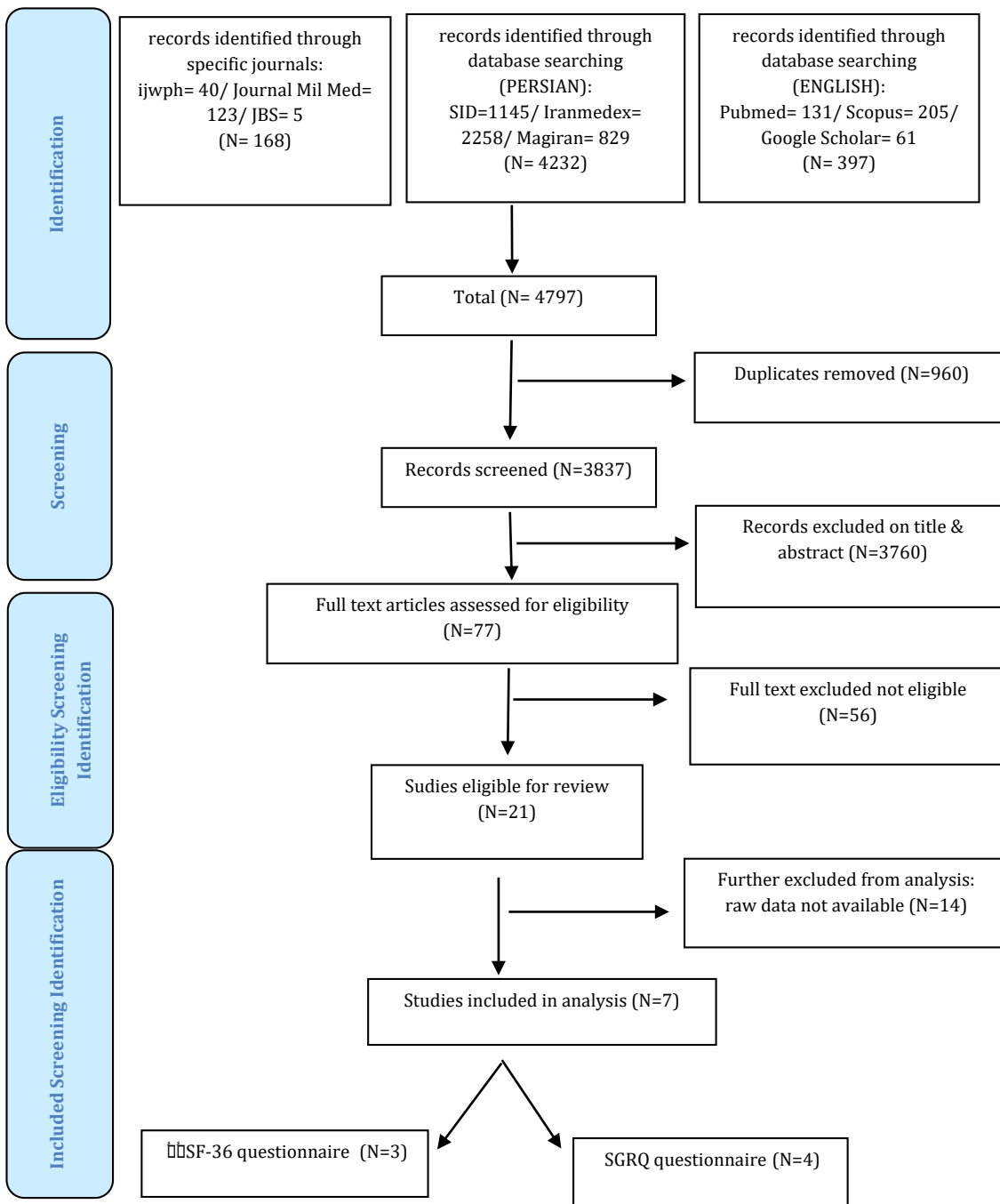


Figure 1) Study selection Diagram

## Findings

In 7 studies that were applied on Iranian male victims (n=1241), their age average had been recorded as 45.66 (rang: 41.18-48.08), which they age between 44.12±4.9 to 48.08±7.8. Also, the tool to measure the QOL between 681 victims for three of the studies had been the SF-36 questionnaire, and in the other four studies, the SGRQ questionnaire had been used for 560 victims of chemical weapons (mustard gas).

The results of the mustard gas victims (MGV) in Iran based on the SF-36 questionnaire showed that the pooled score of all sub-scales was lower than the average (lower than 50). The pooled score of pcs in MGV in Iran was 28.33 (95% CI: 24.02-32.63), whereas the MCS between these victims was 35.83 (95% CI: 29.07-42.59). The chemical gas victims had a lower score in pcs comparing to MCS.

The chemical gas victims in the physical component recorded a low score in the role function-physical subscale, and the general health subscale was 21.76 (95% CI: 19.99-23.53 and 25.44 (95% CI: 19.77-31.11), respectively. This showed that the chemical gas victims enjoy an appropriate situation regarding the subscales. All of the studies showed that the General Health and Role function-physical in the physical component had the lowest scores. The victims had the highest score in the physical component in the physical functioning subscale, which was 40.13 (95% CI: 31.53-48.73). Also, the chemical victims in the mental component

dimension in the role function-emotional and vitality subscales were 31.36 (95% CI: 17.70-45.01) and 34.59 (95% CI: 28.58-40.60) sequentially, which were respectively low scores. This proves that the chemical victims had an unsuitable situation in the subscales. All studies showed that the mental component's role function-emotional and vitality subscales had the least scores. Also, these victims had the highest scores regarding the social functioning subscale 44.83 (95% CI: 43.04-46.63) in mental functioning.

In the SF-36 questionnaire, the lower scores showed the inappropriate situation of life; the results prove that the role function-physical subscale in the physical component and the role function-emotional in the mental component had the most unfavorable status. The combined results of QOL based on SF-36 were reported in Table 1.

The results of the SGRQ QOL questionnaire show that the pooled score of QOL of the chemical gas victims by mustard gas in Iran was 66.9 (95% CI: 56.7-77). The pooled estimated score of the chemical gas victims in the symptom sub-scale was 79.05 (95% CI: 68.8-89.3), which was higher than the activity sub-scale with an average score of 70.6 (95% CI: 65.3-75.6) and the average of the impact sub-scale 58.3 (95% CI: 46.3-70.4). The higher score in this questionnaire was an indication of an unfavorable situation; the chemical gas victims in the symptom sub-scale had more difficulties (Table 2)

**Table 1)** The combined results of SF-36 QOL questionnaire scores (higher scores indicates a better condition)

Variable	Article			Pooled estimate (95% CI)	Heterogeneity Chi-squared	
	1	2	3			
Sample size (Number)	292	147	242	-	-	
Age (Year)	48.08±7.8	44.8±8.6	44.12±4.9	-	-	
<b>Mean (CI 95%) QOL score</b>						
<b>Physical Component</b>	PF	32 (29.6-34.4)	45.3 (42.2-48.4)	43.2 (40.4-46.1)	40.13 (31.53-48.73)	57.67 (p=0.000)
	RP	20.5 (17.1-23.9)	23.1 (20.4-25.7)	20.9 (17.7-24.2)	21.76 (19.99-23.53)	1.71 (p=0.470)
	BP	27.9 (25.3-30.5)	29.5 (26.8-32.2)	35.2 (32.8-37.6)	30.89 (26.41-35.39)	18.40 (p=0.0001)
	GH	20.3 (18.3-22.3)	26.3 (23.9-28.7)	29.8 (27.5-32.2)	25.44 (19.77-31.11)	38.41 (p=0.000)
<b>Mental Component</b>	VT	29.2 (27-31.4)	39.7 (36.7-42.7)	35.1 (32.5-37.7)	34.59 (28.58-40.60)	32.72 (p=0.000)
	SF	42.9 (39.9-45.9)	47.6 (44.1-51)	44.7 (41.8-47.6)	44.83 (43.04-46.63)	4.01 (p=0.135)
	RE	19.8 (15.9-23.6)	43.5 (39.2-7.8)	30.8 (26.5-35.1)	31.36 (17.70-45.01)	64.93 (p=0.000)
<b>Summary measures</b>	MH	41.5 (39-43.9)	47.8 (44.4-51.2)	42.8 (40-45.5)	43.85 (40.37-47.31)	8.81 (p=0.012)
	PCS	25.3 (23.5-28)	27.4 (25-29.8)	32.3 (30.3-34.3)	28.33 (24.02-32.63)	26.44 (p=0.000)
	MCS	29.4 (27.2-31.6)	39.9 (36.7-43)	38.4 (35.9-40.8)	35.83 (29.07-42.59)	42.45 (p=0.000)

PF: Physical Function, RP: Role Function-Physical, BP: Bodily Pain, GH: General Health, VT: The Mental Health consists four sub-scales Vitality, SF: Social Function, RE: Role Function-Emotional, MH: Mental Health, PCS: Physical Component Scale, MCS: Mental Component Scale.

**Table 2)** the combined results of the SGRQ questionnaire scores (lower scores indicates a better condition)

Variable	Sample size (N)	Age (Year)	Mean (CI 95%) QOL score			
			Symptom	Activity	Impact	Total
<b>Article</b>						
4	93	44.03±6.56	85.5 (83-88.1)	77.4 (73.8-81)	68.5 (64.9-72.1)	74.2 (71.5-77)
5	43	42.5±7.4	77.9 (73-82.8)	70.2 (64.3-76.1)	57.8 (51.1-64.5)	64.9 (59.1-70.7)
6	383	41.18±5.6	68.1 (66.4-69.7)	67.4 (65.4-69.3)	47 (44.9-49.2)	56.7 (54.9-58.4)
7	41	48.00±NR	84.8 (81.9-87.5)	67.4 (62.4-72.5)	60.4 (54.8-66.1)	71.7 (68.3-75.1)
<b>Pooled estimate (95% CI)</b>	-	-	79.05 (68.8-89.3)	70.6 (65.3-75.6)	58.4 (46.3-70.4)	66.9 (56.7-77)
<b>Heterogeneity chi-squared</b>	-	-	181.79 (p=0.000)	23.88 (p=0.000)	109.26 (p=0.000)	138.09 (p=0.000)

## Discussion

The current study is the first meta-analysis about the chemical gas victims of mustard gas in Iran. This meta-analysis aims to assess the QOL of MGV in Iran. Considering the meta-analysis results in both questionnaires (Generic and Specific), the chemical gas victims by mustard gas have lower QOL in physical components than mental components. Statistical heterogeneity ( $p < 0.1$ ) was detected in none of the three SGRQ domains; hence, we used the random effect method to combine the scores. According to the meta-analysis results in both SF-36 general QOL questionnaire and the SGRQ dedicated QOL questionnaire, the chemical gas victims by mustard gas had a more unfavorable situation in the physical component than the mental component. In

the SF-36 questionnaire, the role function-physical 21.38 (19.8-22.9) and the general health sub-scales and in the SGRQ questionnaire symptom 79.05 (68.8-89.3) and activity 70.6 (65.3-75.6) sub-scales were related to the physical component of QOL that had the most inappropriate status. This proves that the victims had more problems in the physical component compared to the mental component. In table 3, the meta-analysis results were available in addition to the QOL of two groups: the general Iranian male population and COPD patients.

For better analysis, the results of the current meta-analysis in the SGRQ QOL questionnaire were compared with the COPD and asthmatic patients in Table 4.

The results show that the average combined scores

**Table 3)** Comparison between the SF-36 scores between MGV (chemical warfare patients) and a general Iranian population and a COPD Patients population (higher scores indicate a better condition)

Groups	Scores	Sample size	Mean (CI 95%) QOL score Physical Component				Mental Component				Summary measures	
			PF	RP	BP	GH	VT	SF	RE	MH	PCS	MCS
<b>General Iranian population</b> [41]	Mean (CI)	1997	87.8 (86.98-88.62)	73.8 (72.2-75.39)	82.7 (81.67-83.73)	70.2 (69.34-71.05)	68.9 (68.19-69.61)	78.0 (76.97-79.03)	70.1 (68.36-71.84)	69.2 (68.45-69.95)	81.4 (80.45-82.35)	72.4 (71.44-73.36)
<b>COPD Patients</b> [42]	Mean (CI)	331	30.9 (27.44-34.36)	9.06 (6-12.12)	41.6 (39.25-43.95)	56 (54.05-57.95)	42.04 (40.02-44.06)	51.3 (47.23-55.37)	36.6 (31.43-41.77)	61.9 (60.19-63.61)	34.4 (32.41-36.39)	47.9 (45.37-50.43)
<b>MGV</b>	Pooled estimate (95% CI)	681	40.13 (31.53-48.73)	21.76 (19.99-23.53)	30.89 (26.41-35.39)	25.44 (19.77-31.11)	34.59 (28.58-40.60)	44.83 (43.04-46.63)	31.36 (45.01-47.31)	43.85 (17.70-40.37)	28.33 (24.02-32.63)	35.83 (29.07-42.59)

PF: Physical Function, RP: Role Function-Physical, BP: Bodily Pain, GH: General Health, VT: The Mental Health consists of four sub-scales Vitality, SF: Social Function, RE: Role Function-Emotional, MH: Mental Health, PCS: Physical Component Scale, MCS: Mental Component Scale.

**Table 4)** Comparison between the SGRQ scores between MGV (chemical warfare patients) and COPD Patients population and asthmatic patients (lower scores indicate a better condition)

Groups	scores	sample size	Mean (CI 95%) QOL score			
			Symptom	Activity	Impact	Total
<b>Asthma patients</b> [43]	Mean (CI)	301	65.5 (65.37-65.63)	50 (49.86-50.14)	43.5 (43.35-43.65)	49.5 (49.38-49.62)
<b>COPD Patients non chemical</b> [44]	Mean (CI)	37	53 (46.2-59.8)	55.6 (47.19-64.01)	35.7 (27.81-43.59)	44.5 (37.38-51.62)
<b>MGV</b>	Pooled estimate (95% CI)	560	79 (68.8-89.3)	70.6 (65.3-75.6)	58.4 (46.3-70.4)	66.9 (56.7-77)

in all sub-scales in the SF-36 questionnaire are lower than 50. This means the QOL of chemical gas victims by mustard gas in all sub-scales is low. The chemical gas victims have lower scores in the PCS comparing to the MCS. That means the physical status of the MGV is more inappropriate in comparison to their mental status. There have been few reviews about the chemical gas victims by mustard gas [45]. As a consequence of the chemical gas lesions and chronic respiratory diseases, the disorder in the QOL, especially in the physical component, is expected [34]. Many pieces of research have mentioned factors such as an increase of one-step spirometry parameters, a decrease of FEV1, Bronchiolitis and lack of sports activities that decrease the QOL of chemical gas victims by mustard gas [46]. Other studies also have recorded low physical component sub-scales among the pulmonary patients [47].

The chemical gas victims have the most unsuitable situation in the General Health and Role Function-Physical sub-scales. The Role Function-Physical assesses the limits in doing daily the activities or types of activities [27]. Due to the respiratory complications by the mustard gas, the chemical gas victims cannot do their daily activities easily, which limits and hardens their physical functions. The general Health sub-scale assesses the health of patients, including the current health, the person's point of view about health, and resistance against diseases [27]. Due to the injuries in several body members such as lungs, eyes, skin and nerves, the chemical gas victims of mustard gas are suffering from diseases and body complications. The studies refer the lowest QOL to the victims suffering from different diseases simultaneously [46].

This long chronic status negatively affects the point of view of the patient about his health and decreases

the body's resistance against the diseases. The decline of body resistance could cause cancer disease for the chemical gas victims by mustard gas [48, 49].

Also, the chemical gas victims experience an inappropriate situation in the Mental Component, especially in the role Function-Emotional and vitality sub-scales. The Role Function-Emotional sub-scale measures the disorders caused by emotional problems in daily activities such as reducing time for doing activities and performance of activities with lesser accuracy contrary to past habits [27]. The body diseases and complications caused by mustard gas create problems for the chemical gas victims. These emotional problems decrease the patience, accuracy, and quality of the victims' performance [46, 50, 51].

On the other hand, the psychological diseases in MGV such as Post-traumatic stress disorder (PTSD), anxiety and depression are higher than average, which reduce the role Function-Emotional among these victims [50]. Vitality is a concept that measures liveliness and happiness, which are the opposite point of fatigue and exhaustion [27]. For being delighted, a person needs a healthy body and well mind. Usually, the people who have a more healthy body and mind would experience more vitality and happiness. The chemical gas victims by mustard gas feel tired and exhausted due to the late complications and prolonged physical and mental complications [36]. Also, the researches show that the chemical gas victims with a higher percentage of injuries experience a lower QOL [37].

Comparing the average of QOL among the male population in Iran [35] with the combined SF-36 questionnaire sub-scales scores average of QOL in MGV shows that the scores of the chemical gas victims by mustard gas are measured very low in all sub-scales (Table 3). Jafari's studies also prove that the QOL of chemical gas victims by mustard gas is very low in all sub-scales compared to Iran's population [34]. The scoring average of the general public in Iran in the PCS is 81.4 (21.8) and in the MCS is 72.4 (21.9), whereas in the current study is 28.33 (24.02-32.63) and 35.83 (29.07-42.59), respectively, which shows the significant difference in the scores. Unlike the chemical gas victims, the score of the general public of Iran in the PCS (81.4 (21.8)) is higher than the MCS (72.4 (21.9)). The physical problems among the chemical gas victims by mustard gas are more prominent than mental health problems. This shows that physical status affects the QOL highly. The general population has better QOL due to lack of affection for special physical and mental diseases, but we have compared both groups (chemical gas victims & general population) in the table to show the significant difference between the two.

Also, the comparison between the average of the scores of QOL among COPD patients and combined scores average of SF-36 questionnaire sub-scales in the chemical gas victims by mustard gas (except the Physical functioning and Role Function-Physical subscales) shows that all of the MGV have lower scores compared to the COPD patients [42]. The PCS (34.4 (18.5) and MCS (47.9 (23.5) in the COPD patients are higher than the PCS (28.33 (24.02-32.63)) and MCS (35.83 (29.07-42.59)) among the chemical gas victims by mustard gas which shows the inappropriate situation of MGV (Table 3). The scores of PCS and MCS in both groups are lower than the average, but the scores regarding the chemical gas victims by mustard gas are lower, which shows lower QOL than the COPD patients. These victims have very low scores in the Physical Component, especially in the Physical functioning and role Function-Emotional sub-scales like COPD Patients, whereas in the Bodily Pain and General Health sub-scales, the COPD patients have higher scores. Though COPD patients have more physical problems, their pain tolerance and general health are relatively high. Pain has a minor effect on the daily activities of COPD patients, and they have a better perspective about self-health and higher resistance against diseases [52]. The COPD patients and chemical gas victims have the lowest scores in the Mental Component, especially in Vitality and Role Function-Emotional sub-scales, but the Mental Health status is lower in the chemical gas victims than the COPD patients. Though the Vitality and Role Function-Emotional sub-scales are low in the COPD patients and chemical gas victims, the COPD patients experience more vitality and lesser exhaustion. The chemical gas victims by mustard gas have psychological disorders and war psycho-social complications like PTSD, anxiety, depression [50], and sometimes they experience a combination of disorders that would lead to the decline of their MH, which is not necessarily seen in COPD patients [38, 39]. The results of the SGRQ questionnaire show that the average QOL between the chemicals gas victims by the mustard gas in Iran is 66.9 (95% CI: 56.7-77). This score represents the unfavorable QOL between the chemical gas victims. Other studies also agree with the statement above, and there is consensus between almost all the studies that the score of QOL among the chemical gas victims is low [37-40]. Nevertheless, the difference between these researches is their low scores of QOL. The low QOL could result from pulmonary complications, restriction of movement, shortness of breath, mental disorders and social disorders caused by respiratory diseases and their effect on social performance [45, 46].

Also, the chemical gas victims have the highest score and the most inappropriate situation in the

Symptom sub-scale with an average of 79.05 (95% CI: 68.8-89.3). This component is concerned with the effect of respiratory symptoms, their frequency and severity [53]. The most unsuitable situation for the chemical gas victims is in this sub-scale, a complication by mustard gas mainly related to pulmonary and respiratory complications. The studies show that as the severity of the chemical injury increases, the pulmonary complication also increases and as a consequence, the QOL of the chemical gas victims decreases [19, 36-38, 40].

To precisely analyze the results of the meta-analysis in the SGRQ questionnaire were compared with the QOL among the COPD and asthmatic patients with almost the same situation as the MGV (Table 4). Also, to compare the data with one another, the standard deviation (SD) of the COPD and asthmatic patients were changed to the confidence interval (CI) formula. The comparison between the average score of QOL of COPD and asthmatic patients and the QOL of MGV by the SGRQ questionnaire reveals all scores of MGV are higher, which proves their improper situation (Table 4). Though the QOL has been affected strongly by the physical problems both in the COPD and asthmatic patients and the MGV, other special or unique factors have a greater effect on the decline of QOL between the MGV. The studies point to the simultaneous affection to different diseases (like Respiratory, ocular, dermatological and psychological diseases) [36, 37, 39, 52, 54], Skin lesions (like skin blister, irritation, Excoriation and Lichenification) [55], psychological disorders (like PTSD, depression and anxiety) [34, 37-39, 52], disorders in the personal relations (like sexual relation) [55, 56], interpersonal relation and social function disorder [40, 41, 55].

As COPD patients and MGV suffer from respiratory and pulmonary complaints, we suggest more comparative studies on QOL among the two groups. There shall be studies aiming to differentiate the COPD patients and MGV with the help of the SRGQ and SF-36 questionnaires, as both are prevalent questionnaires. Also, designing and implementing interventional studies can be useful in order to scrutiny the interventions on the QOL of MGV. As there is a lack of meta-analysis studies about the chemical gas victims by mustard gas in Iran, we believe this study can be considered the basis for interventional studies. Lack of information about simultaneous and multiple diseases of the chemical gas victims was one of our limitations.

## Conclusion

The QOL between the victims of chemical gas by mustard gas in Iran has been very low. These victims have an unsuitable situation both in physical component and a mental component. While they have a better situation in the mental component comparing to the physical component.

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