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# The Effect of the Unpleasant Odor of Gohar Rood River in Rasht on the Quality of Life of Human Communities

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**KEYWORDS**

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**ABSTRACT:** Unpleasant odor caused by sewage disposal in rivers, in areas where proper and adequate arrangements have not been made for wastewater treatment, is one of the obvious indicators of air pollution affecting a large population of people living in these areas. This study aimed at investigating the effects of odor-producing gases in the Gohar Rood river in Rasht, as one of the most polluted rivers in northern Iran, on human communities. In this research, the descriptive-analytical method has been used as a comparative analysis based on hierarchical weighting. The statistical population in the communities near and far from this river was 420 and 115 people, respectively. In order to analyze the studied variables, SPSS software, and statistical methods of independent t-test and Levene test were used. The results of a comparative study of the effects of unpleasant odor in communities near and far from this river using t-test of two independent groups and Levene test indicated that clinical symptoms (33.19; 50.86), anxiety symptoms and sleep disturbance (11.89; 17.12), social dysfunction (15.02; 23.13) and depressive symptoms (5.52; 7.16) of communities exposed to the unpleasant smell of this river were significantly higher than other communities ($p < 0.05$). Therefore, people exposed to the unpleasant odor of Gohar Rood river were more dissatisfied with the living conditions in their surroundings and they had a worse quality of life.

## INTRODUCTION

Quality of life is a broad concept including concepts such as the quality of the environment, including the natural environment and the humanizing environment [1]. Quality of life includes individual and social well-being, but focuses more on people's living spaces and includes environmental conditions in a specific place [2]. The term quality of life generally refers to the state of the environment in which people live, such as environmental pollution, as well as to some personal conditions, such as health [3]. Increasing interest of people in the environment and more attention to quality of life has caused bad odors to be considered as harmful air pollutants [4]. Anaerobic conditions lead to the production of odorous gases, which are considered as a source of air pollution by being in the category of air pollutant gases [5]. Gaseous compounds such as hydrogen sulfide, ammonia [6] and mercaptans [7]

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are odor-producing gases that can be projected at different concentrations in the environment, from unpleasant odors to physical symptoms [8] and in case of continuous inhalation or in high concentrations, it can lead to the occurrence of various physical and mental diseases [9] among human societies affected by odor.

Humans perceive the creation or change of odors in the environment [10]. However, the threshold for perceiving smell varies from person to person [11]. Studies conducted in the form of surveys of local communities exposed to odorous compounds indicated that most people exposed to odor-producing gases referred to them as an unpleasant odor [12, 13]. Unpleasant odor in the surrounding environment leads to social complaints of people exposed to it [14].

Odor-producing gases in the environment are perceived generally sensorial by examining local communities in the presence of odors that are met with a negative feeling [15, 16]. Evaluating the effect of unpleasant odors in local communities, using survey questionnaires and their distribution among human communities are affected by negative feelings [17]. Unpleasant odors have been a social problem in the past, but recently there has been concern about their potential impact on health and quality of life [18]. In addition to the routine of daily life [19], the odor can affect the decisions of people exposed to odor [20], their health and quality of work, and the health of human societies [21]. Studies conducted in this regard, reviewing surveys of people exposed to unpleasant odors, indicated that the increase in unpleasant odors leads to an increase in physical complications in communities close to sources of odor, such as the use of plant fertilizers in mushroom cultivation [22] and livestock [23]. The results of a study by Ulutas et al. [24] on the effect of unpleasant odors on sewage facilities on human communities indicated that 97% of people in local communities complained of the presence of odors and considered it to be effective in reducing human health and quality of life. In a study of industrial odors in Globeville, USA, Mohamed et al. [25] reported the intermittent odor of coal fibers in the development of eye and throat irritation, skin irritation, headache, and sleep disturbance. Studies in North Denver, USA, on the relationship between the smell of industry and human societies, showed that unpleasant odors affect people's health [26, 27]. Vantarakis et al. [28] in a Swedish survey have shown that an increase in unpleasant odor, in addition to physical effects such as increased headache, unusual fatigue and heaviness of the head, also causes an increase in mental disorders.

Luginaah et al. [29], by researching the effects of the smell of an oil refinery in Oakville, Ontario, showed that increasing the unpleasant odor leads to increased stress. Prolonged exposure to odor stress can lead to depression and cardiovascular disease [30]. Increased industrial odor is associated with increased sleep problems and nightmares among employees and their families in Pima County, Tucson [31]. Unpleasant odor reduces the value of the property. The results of Batalhone et al.'s [32] study on the value of odor-bearing properties in Brasilia, as well as the results of Fries' [33] study on the effect of industrial odors on residential homes in four cities: Costa Mesa, Newport Beach, Huntington Beach and Seal Beach showed that residential homes prices exposed to the odor of a wastewater treatment plant were much cheaper than homes farther away. The results of a study by Wojnarowska et al. [34] among the residents near septic tanks in southeastern Krakow, Poland, indicated a negative effect of odor on the quality of life of residents exposed to unpleasant odors and a greater tendency to relocate.

Gohar Rood river, passing through the south-north route of Rasht city, flows in lowland areas with high groundwater level, and in its route, in addition to the impact on groundwater resources, affects marginal river dwellers, transit citizens and tourists in this area [5]. Residential units located on the banks of the river discharge 90% of their sewage into the river through cement pipes [35], domestic sewage along with agricultural, industrial, hospital and even waste disposal and the resulting leachate play a decisive role in the pollution of this river [36].

A sharp and sudden drop in the slope of the river in its course in the city of Rasht, along with the entry of a huge volume of wastewater, leads to increased mud and wetting, lack of proper oxygenation of river water and the release of odor-producing gases in neighborhood areas [37]. Due to

the presence of unpleasant odors in a wide area along the river and the hypothesis of the presence of odorous compounds above the human olfactory threshold, the Gohar Rood river in Rasht, as one of the most polluted rivers in the world [35], was selected. The purpose of this study was to investigate the effect of unpleasant odor among marginalized residents compared to distant residents who are not exposed to unpleasant river odor. Therefore, due to the wide range of movement of this river and the general dissatisfaction of local communities, as well as non-native tourists in this important tourist area of northern Iran, due to the lack of any qualitative history between human communities in this regard, Gohar Rood river in Rasht was checked. Also, it is noteworthy to mention that this is the first study on the impact of river originated odor on the human population in Iran, despite many polluted urban rivers in this country.

## MATERIALS AND METHODS

Gohar Rood river originates from 700 meters of Saravan mountains in Longtitude:49.585461616, and Latitude:37.193595650. It has 16 km route in Rasht city in Iran. This river in city exit, by connecting to Pirbazar river at Longtitude:49.552731961, and Latitude:37.295789215. This descriptive study was conducted from July to September 2019 in Rasht city, Iran by identifying neighborhoods near and far from the Gohar Rood river in Rasht. According to this study, 10 urban neighborhoods in the vicinity of this river were identified. The number of urban neighborhoods is the basis for selecting questionnaire distribution stations along the 16 km route of Gohar Rood river in Rasht. The statistical population of this study was 42105 citizens of Rasht living in the mentioned parts of the city. In this regard, the first place of human exploitation at distances <100m in summer, in areas such as benches in the parks along the river of Gohar Rood, sports equipment located in the parks, children's playgrounds, special walking paths of citizens and residential houses adjacent to this river were considered using simple random sampling method in the crowded passage of Gohar Rood river. The sample size based on the objectives of the study was 380 people using Cochran's formula (Equation 1) with an error rate of 0.05 (d = 0.05), for the inhabitants of the Gohar Rood river. For distributing the questionnaires in marginalized communities affected by the unpleasant smell of Gohar Rood river in Rasht, 420 participants were selected.

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{N}\left[\frac{z^2 pq}{d^2} - 1\right]} = 380 \rightarrow 420 \qquad \text{Eq. (1).}$$

d=0.05 z=1.96 p=q=0.05 N=42105

In order to compare and obtain documented results between marginalized communities and communities far from the Gohar Rood river (> 1km) (Figure 1), the statistical population of one hundred people with 15% error were used to ensure the number of samples selected for the community (115 individuals).

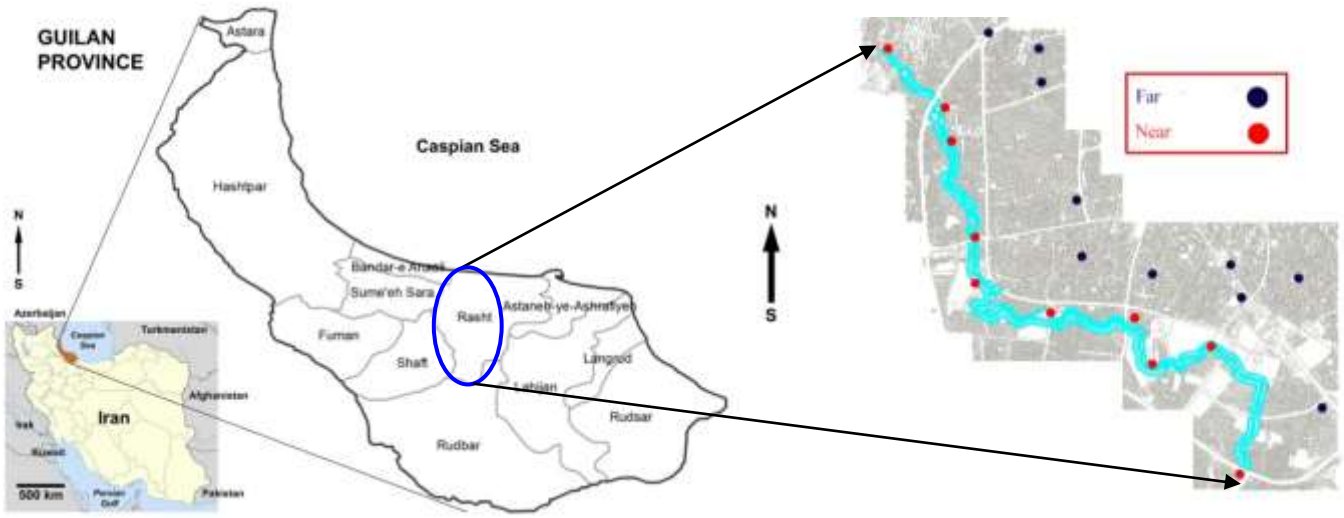


**Figure 1**. Questionnaire distribution stations along the Gohar Rood river

In order to prepare the distributed questionnaire, standard models such as mental health questionnaire, Goldberg and Hiller general health questionnaire, quality of life questionnaire (S36), quality of life questionnaire of the World Health Organization (WHOQOL-BREF) were used. The questionnaire used consisted of 76 questions in six sections: in the first part with 14 questions, concepts such as general characteristics, distance to the source of odor and respondents' opinion about the season and months when the odor is more annoying were considered. In the second part, 32 clinical questions, problems and various physical diseases were examined. In the third part, with 7 questions, anxiety symptoms and sleep disorders were considered, and in the fourth part, social dysfunction was considered with 7 questions. In the fifth section, depressive symptoms were presented with 4 questions and in the sixth section, dissatisfaction with the quality of life of residents near and far from the Gohar Rood river was examined from the perspective of the effect of unpleasant odor of this river by presenting 12 questions. Questionnaires were distributed based on population ratio of 68% male and 32% female, with an average of 95.5% of people over the age of 20 years. Finally, the obtained data were analyzed using SPSS software and two independent sample t-test and Levene test to compare the effect of unpleasant odor of this river on human communities exposed to river odor and compared with communities of citizens of this city that were not exposed to odors.

## RESULTS

The results of the citizens' survey in the face of the unpleasant smell of the river on the Gohar Rood river indicated that all respondents from communities near and far from the river (100% of respondents) complained about the presence of annoying odors in areas such as benches in the park, sports equipment located in the parks, play equipment and playgrounds for children, special sidewalks for the citizens of the city and residential houses adjacent to the river at distances <100m, emphasizing the summer season. The respondents did not have an opinion about the annoyance of the unpleasant smell of this river in other seasons. As shown in Table 1, most of the respondents inhaled the most unpleasant odor in August.

**Table 1.** Frequency distribution of unpleasant odor of Gohar Rood river in summer months

| Months / months of summer | Percent |
|---|---|
| **July, August** | 9.3 |
| **August** | 58.8 |
| **August, September** | 15.5 |
| **July, August, September** | 16.4 |

The inhabitants of this river were exposed to significant time intervals when they created an unpleasant odor in the environment around the Gohar Rood river. As shown in Table 2, the highest hours of exposure to the unpleasant odor of this river, with a frequency distribution of 59% in 7-12 hours of the day were among the suburbs.

**Table 2.** Frequency distribution of the period of exposure of suburbs to unpleasant odor of Gohar Rood river.

| Duration of exposure (hour) | 0-6 | 7-12 | 13-18 | 19-24 |
|---|---|---|---|---|
| **Percent** | 36.2 | 59 | 2.4 | 2.4 |

The results of the survey of the comments of the suburb respondents who are exposed to the unpleasant odor of the Gohar Rood river for many hours, indicated that all the suburb residents (100% of the respondents) of this river were annoyed by the odor. In this regard, by comparing the answers related to the self-report of citizens in areas near and far from the Gohar Rood river regarding the occurrence of clinical symptoms such as headache, eye irritation, swelling of the mouth and throat, palpitations, pain in the heart and chest, nausea and heartburn, muscle pain and bruising, shortness of breath, sputum and bloody cough, numbness of the limbs or tingling and moaning, hormonal disorders, symptoms of allergies and respiratory allergies, anorexia and malnutrition, recurrent colds and flu, cancer, infertility, children with disabilities, co-morbidities among family members, feelings of weakness and lethargy and having a specific medical record of local communities exposed to the unpleasant smell of this river and comparing it with the response of people living far from this river indicated more pronounced symptoms (Figure 2), such as burning eyes and tears, headache and nausea or heartburn, between those close to the river with significant differences ($p < 0.05$).

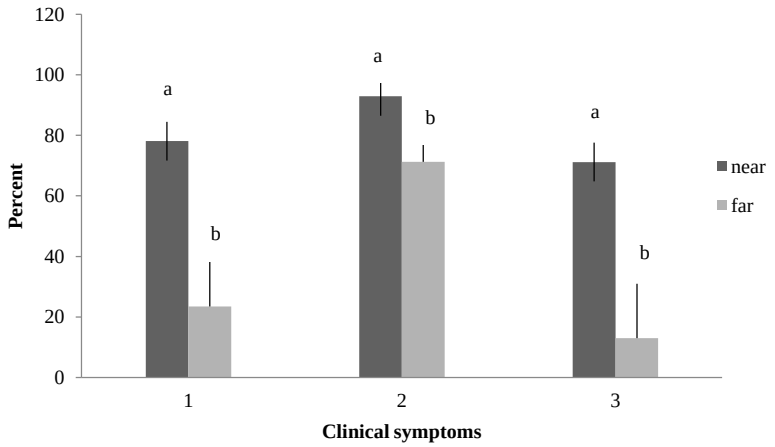


**Figure 2**. Comparison of the frequency distribution of the incidence of obvious clinical symptoms among the suburb residents exposed to the unpleasant odor of the Gohar Rood river and people far from it.
*The different letters show significant difference (P <0.05).
** Clinical symptoms: Code (1): burning eyes and tears, code (2): headache, code (3): nausea or heartburn.

Examining the answers to questions about the onset of anxiety symptoms and sleep disturbances such as anger and mood disorder, constant tiredness, feelings of fear and panic, getting out of control, sleep disturbances including reduced bedtime, waking up earlier than usual and lack of continuous sleep and continuous waking during night sleep, it was shown that these symptoms were more frequent among local communities exposed to the unpleasant odor of this river compared to those far from that (Figure 3) and there was a significant difference between the communities near and far from the river ($p < 0.05$).

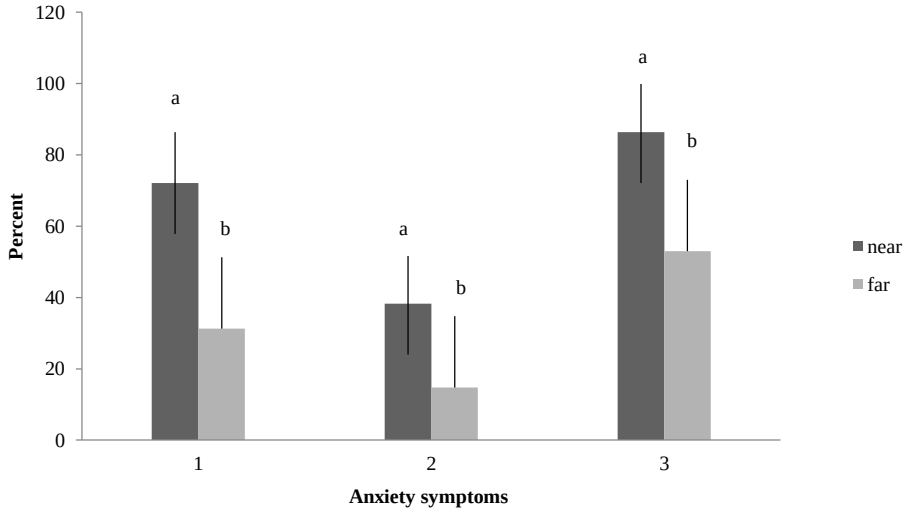


**Figure 3.** Comparison of the frequency distribution of anxiety symptoms and sleep disorders among suburbs exposed to the unpleasant odor of the Gohar Rood river and people far away.
*The different letters show significant difference (P <0.05).
** Anxiety symptoms: Code (1): getting out of control, code (2): fear and panic, code (3): reduced bedtime.

Examining the answers to questions about social functioning such as the level of enjoyment of normal activities, decision-making power, effective role in doing things, doing things well, the need to spend more time doing things, feeling embarrassed in social relationships and arguing and conflicts with people between local

communities exposed to the unpleasant smell of this river and comparing it with the response of people living far from this river, it was shown that the emergence of these symptoms (Figure 4), were more frequent in close communities and the difference was significant compared to communities far away ($p < 0.05$).

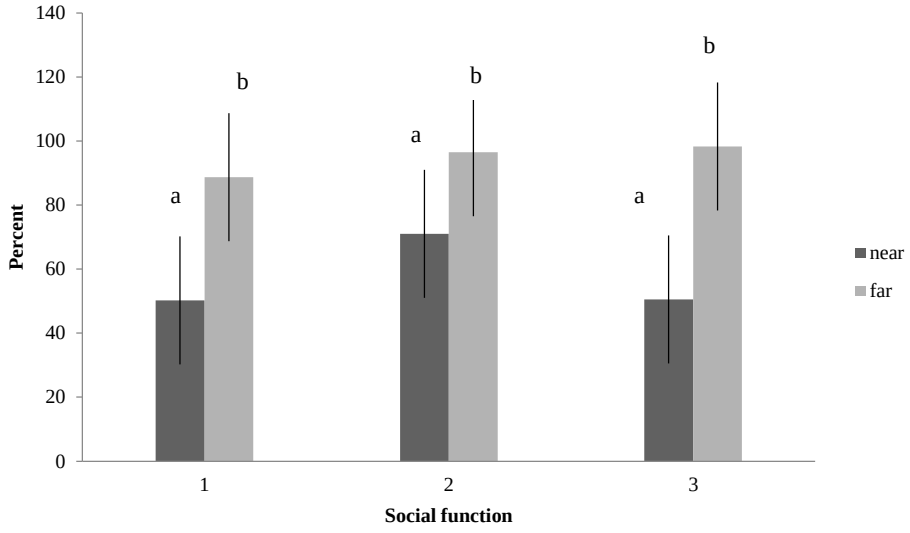


**Figure 4**. Comparison of the frequency distribution of social function among the suburbs exposed to the unpleasant odor of the Gohar Rood river and people far away.
*The different small letters show significant difference (P <0.05).
** Social function: Code (1): enjoyment of normal activities, code (2): effective role in doing things, code (3): doing things well.

Examining the answers to questions about depressive symptoms such as inability to work due to nervous disorders, feeling worthlessness, frustrating life and thinking of self-destruction among local communities exposed to the unpleasant smell of this river and comparing it with people living far from this river indicated significant differences in more pronounced symptoms (Figure 5), such as self-deprecation and frustrating life, between communities near and far from the river ($p < 0.05$).

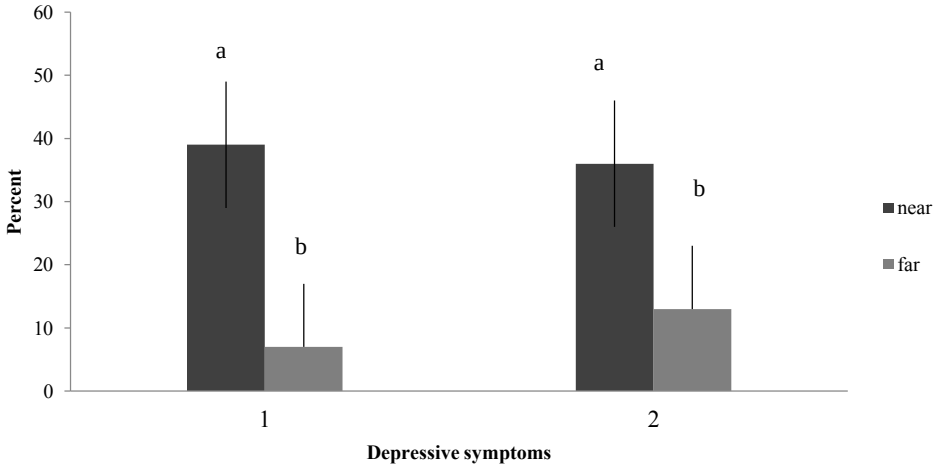


**Figure 5**. Comparison of the frequency distribution of depressive symptoms among suburb people exposed to the unpleasant odor of the Gohar Rood river and people far away.
*The different small letters show significant difference (P <0.05).
** Depressive symptoms: Code (1): self worthlessness, code (2): frustrating life.

Investigating the response of citizens exposed to unpleasant odor of Gohar Rood river regarding their perception of the quality of life and comparing it with residents away from unpleasant odor in Rasht city by considering options such as satisfaction with residence, satisfaction with emotional relationships with others, considering the environment healthy, feeling relaxed, enjoying life, sleep satisfaction, satisfaction with daily activities and the use of air fresheners, perfumes, and colognes, indicated more obvious symptoms (Figure 6), such as decreased satisfaction with the place, considering the environment healthy, feeling of peace, enjoyment of life, sleep satisfaction and daily activities in communities exposed to odor with a significant difference ($p < 0.05$) compared to communities far from the river.

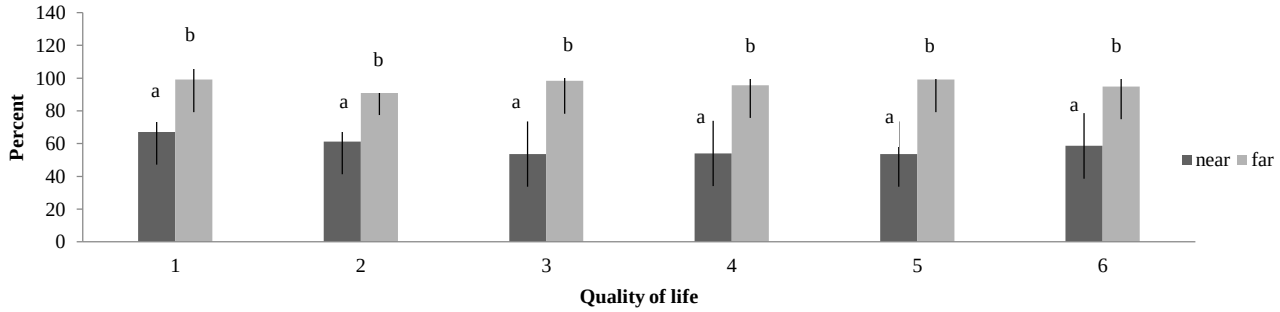


**Figure 6.** Comparison of frequency distribution of quality of life among suburb people exposed to unpleasant odor of Gohar Rood river and people far from it.
*The different small letters show significant difference ($P < 0.05$).
**Quality of life: Code (1): satisfaction with the place, code (2): considering the environment healthy, code (3): feeling of peace, code (4): enjoyment of life, code (5): sleep satisfaction, code (6): satisfaction with daily activities.

The results of this study on the comparative study of the effects of unpleasant odor on communities near and far from the Gohar Rood river in Rasht based on the respondents' views on various aspects affecting life, including the results of a comparative study in the present study on the occurrence of different symptoms in communities near and far from Gohar Rood river using independent t-test and Levene test, indicated a significant level of test (sig = 0.000) that was less than 0.05 in all groups and a significant difference was observed with 95% confidence between communities near and far from Gohar Rood river.

**Table 3.** Comparative study of the incidence of different symptoms using t-test between communities near and far from the Gohar Rood river in Rasht

| Symptoms | Group | Number | Mean | Standard deviation |
|---|---|---|---|---|
| Clinical symptoms | near | 420 | 50.86[a] | 13.14 |
| | far | 115 | 33.19[b] | 6.48 |
| Anxiety symptoms and sleep disorders | near | 420 | 17.12[a] | 6.39 |
| | far | 115 | 11.89[b] | 3.47 |
| Social dysfunction | near | 420 | 23.13[a] | 3.51 |
| | far | 115 | 15.02[b] | 2.84 |
| Depressive symptoms | near | 420 | 7.16[a] | 3.32 |
| | far | 115 | 5.52[b] | 1.85 |
| Dissatisfaction with quality of life | near | 420 | 44.35[a] | 5.55 |
| | far | 115 | 22.77[b] | 4.11 |

Non-common letters (a, b) indicate a significant difference ($p < 0.05$) in the occurrence of symptoms between human communities near and far from the Gohar Rood river.

As shown in Table 3, there is a significant difference between near and far communities regarding the parameters studied in this study. According to the ratio obtained in different sections including clinical symptoms (50.86; 33.19), anxiety symptoms and sleep disorders (17.12; 11.89), social dysfunction (23.13; 15.02), depressive symptoms (7.16; 5.52), dissatisfaction with quality of life (44.38; 22.77), it is noteworthy that marginalized communities that were exposed to the unpleasant odor of this river, significantly showed symptoms such as anxiety, anger, sleep disorders, social dysfunction and depressive symptoms compared to communities far from the river ($p < 0.05$).

## DISCUSSION

Attention to air pollution is essential for human health. Unpleasant odor caused by Gohar Rood river in Rasht is an important indicator of air pollution in this city and therefore, considering the importance of the issue in urban and regional areas, in this study, a comparative study of the effect of unpleasant odor of this river on the health and quality of life of human societies in communities near and far from the source of pollution were studied. Although, in communities affected by odor, the effect of odor on the health and well-being of people exposed to odor is evident. However, the mechanism and details of effectiveness are not yet known the subject of future research by interested researchers in scientific disciplines related to the study of this mechanism [38, 39].

The results of surveys conducted by respondents near and far from the unpleasant smell of this river and the comparison between the two communities in different areas including clinical symptoms, anxiety symptoms and sleep disorders, social dysfunction, symptoms of depression and dissatisfaction with quality of life indicated a significant difference between two communities near river banks and far from it ($p < 0.05$) and all the parameters that resulted in a more desirable quality of life who are exposed to the unpleasant smell of the river were much lower.

Previous studies on the range of clinical manifestations of hydrogen sulfide gas in humans [40] as a gas odor generator in the air indicate a range of effects with increasing concentration of this gas (Table 4). The results of field studies on the occurrence of clinical symptoms among the respondents and comparative comparison with the previous results, with full compliance with the occurrence of obvious symptoms among local communities exposed to unpleasant odors of Gohar Rood river such as annoying odor, nausea, eye irritation, and tears and headaches are associated with the possibility of hydrogen sulfide gas being present in the river.

**Table 4.** The effect of hydrogen sulfide gas on humans [40]

| Effect | Concentration (ppm) |
|---|---|
| **Threshold of smelling** | 0.01-0.3 |
| **Annoying odor, nausea, tearing and, if persistent, headache** | 1-20 |
| **Nasal irritation, sore throat and lungs, difficulty swallowing and digestion, and loss of appetite, a bad sense of smell, acute conjunctivitis (pain, tears, and sensitivity to light)** | 20-50 |
| **Severe burning of the throat, nose, and lungs, complete loss of sense of smell** | 50-250 |
| **Lung swelling (accumulation of fluid in the lungs)** | 250-500 |
| **Severe heartburn, headache, nausea, and dizziness, fall, anesthesia, and death within a few hours, memory loss during contact** | 500 |
| **Stop breathing, irregular heartbeat, fall, and death** | 500-1000 |
| **Immediate death** | >1000 |

In this study, in order to investigate the effects of unpleasant odor of Gohar Rood river on communities exposed to odors, a comparison of the incidence of symptoms through respondents' field perceptions between communities near and far from the source of odor was investigated

Previous studies on the effect of unpleasant odors from various sources on human communities have shown a decrease in psychological comfort among local communities exposed to unpleasant odors in various industries in Colorado, USA [41], an increase in mental disorders in local communities exposed to unpleasant odors of sewage from houses in Sweden [28], increased stress and anxiety in local communities exposed to unpleasant odors in Ontario oil refinery, Canada [42] and increased anxiety and sleep disturbances with continuous exposure to unpleasant odors of various sources of odor in Steyr (Styria), Austria [43]. As can be seen, the results of the investigations conducted in this study, with more details about the incidence of symptoms, are consistent with the effective results in reducing mental comfort, anxiety symptoms and sleep disorders in previous studies.

A study conducted among the residents of the Gohar Rood riverside area showed that in terms of choosing a place to live and buying a house along the river, there was a reluctance to choose a house in the presence of an unpleasant odor, and residents of the surrounding areas considered lower prices for residential houses as a more decisive factor than the quality of the environment in choosing their place of residence.

Field comparative studies of the present study indicated that communities exposed to unpleasant odors of this river with a significant difference ($p < 0.05$) compared to communities away from unpleasant odors were faced with a decrease in items such as satisfaction with housing, knowing about the environment health and feeling calm and happy in their place of residence, which leads to a decrease in social interactions along with increased guest dissatisfaction and increased frequent ventilation in residential houses in the face of unpleasant odors of this river and the desire of local communities to change their current residence.

Bad odor is an important factor in negative assessment of the environment, public complaints about the residence, non-use of open spaces such as gardens or balconies in surveys among residents exposed to different sources of odor in Madrid and Barcelona, Spain [44], decreased guest reception due to frequent guest complaints of unpleasant odors from the sewer system at the residence in EZMIR, Turkey [45], social dissatisfaction and a tendency to move out of the current living space among residents near septic tanks in Poland [34].

Studies of properties exposed to odors from wastewater treatment plants in Brasilia showed that unpleasant odors necessitate leaving the home due to the negative impact of odors on quality of life. The more people complain about the unpleasant smell in the environment, the more there will be no regrets about the relocation. Absence of unpleasant odor in the environment is one of the factors considered in the selection of residential properties and the presence of unpleasant odor leads to economic damage by reducing the value of assets [46]. Survey among residents around the Gohar Rood river, in continuous exposure to the unpleasant odor of this river, in the maximum distribution of exposure time (7-12 hours per day in summer), indicated the occurrence of social dissatisfaction in 100% of local communities exposed to odor. Previous studies have shown that social dissatisfaction with the odor-hour frequencies of Austrian pig farms is more pronounced than the intensity of the odor [11] and between increasing the duration of exposure to the unpleasant odor and the occurrence of dissatisfaction, there was a direct correlation regarding bird sanctuaries and the unpleasant odor of sewage sludge in communities with Austrian odors [43]. The present study is consistent with previous studies and showed similar results in the occurrence of dissatisfaction among the residents of this wastewater river compared to distant communities in expressing dissatisfaction due to prolonged and continuous exposure to unpleasant odors ($p < 0.05$). The longer communities are exposed to odors, the more social dissatisfaction there will be.

Previous studies on the social functions of communities exposed to odors in landfills in Poland indicated disorders such as reduced social activity [47]. Comparison of field studies of the present study on social functions among marginalized people exposed to the unpleasant odor of the Gohar Rood river with previous research, showed consistent results in reducing social activities with more details on how to reduce associated social activities so that the communities exposed to the unpleasant smell of this river experienced a significant decrease in the desirability of doing things, reducing the pleasure and affecting their daily activities ($p < 0.05$).

## CONCLUSIONS

Environmental pollution threatens the health of individuals and the individual and social well-being of human societies, so that the increase of unpleasant odors in the category of air pollution is one of the parameters affecting the reduction of health, personal and social well-being. It leads to a reduction in the quality of life in different communities exposed to odors. Unpleasant odor of Goha Rood river in increasing air pollution and its effect on factors affecting the quality of life of human communities exposed to unpleasant odor is evident through comparative study of communities far from this river. Peace, pleasure and satisfaction with the result (44.38; 22.77) between communities near and far from the unpleasant smell of this river, showed a significant difference in communities near and far from this river ($p <0.05$). Studies showed that the unpleasant smell of this river reduced such things as satisfaction with the place of residence, knowledge of the environment health, feeling calm, enjoying life, satisfaction with sleep and daily activities, in a way that residents of nearby areas and people exposed to the unpleasant odor of the Gohar Rood river have described a more unfavorable quality of living conditions in the environment around the river. Environmental observations in this study indicated evidence that can be fruitful in future planning regarding the unpleasant odor of this river. The results of the studies indicated that there was a direct relationship between the maximum odor in August and the amount of sewage in the river. In this month, due to the arrival of rice harvest time and the closure of the Speed Road Dam upstream of this river, during the harvest, the amount of water in this river is minimized and the Gohar Rood river becomes a sewage river. Despite the high temperature in summer, lack of wind and history of rain, this leads to a more unpleasant odor in this river.

Successful management in improving the quality of life in terms of air pollution and controlling unpleasant odors in sewage rivers such as the Gohar Rood river involves a range of considerations and choices. On the one hand, creating and using principled methods of wastewater disposal and using treatment systems to control the outflow of wastewater into rivers and, on the other hand, awareness of the impact of unpleasant odors of such rivers in developing countries such as Iran is not known by the people. The present research and public information can lead to public awareness and the activities of non-governmental organizations as a lever to require more relevant officials and managers to raise awareness and pay attention to the urgency of turning rivers into urban sewers and exposing a wide range of human societies as a citizen's demand for a healthy environment has led to the prioritization of solutions to reduce and prevent this problem among the authorities.

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### *Conflict of interests*

The authors declare that there are no conflicts of interest.

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