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Environmental pollution and health in Chilean older adults: Impact on quality of life and functional autonomy

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Abstract

Background and Aims: Due to increased urbanization and industry, environmental pollution is a serious public health concern. Globally, the quality of life is particularly lowered by exposure to high amounts of particulate matter (PM). Chile has five industrial zones with high pollution levels, called "sacrifice zones." However, the effect of polluted air on the quality of life and functional autonomy (FA) of older people living in industrial zones with high pollution levels is unknown. Therefore, this study aimed to determine the quality of life and FA differences between Chilean older women (OW) living in areas with lower and higher PM levels.

Materials and Methods: Seventy-two OW volunteered for this study. The sample was divided into Zone 1 ($PM_{2.5} \leq 15\ \mu g/m^3$, $n = 36$) and Zone 2 ($PM_{2.5} > 15\ \mu g/m^3$, $n = 36$). The variables were quality of life—assessed through the SF-36v2.0 questionnaire, and FA—assessed through the GDLAM protocols. Differences between zones were tested by Student's *t*-test and Mann–Whitney test, both for independent samples ($p < 0.05$).

Results: All eight dimensions of quality of life were lower in Zone 2, of which the role emotional (RE) showed significant differences between zones ($p < 0.05$). Performance on the GDLAM protocols and the FA index were lower in Zone 2 ($p > 0.05$).

Conclusion: OW in Zone 2 showed lower quality of life and FA. PM could affect the older population's physical and mental health and, therefore, the quality of life.

KEYWORDS
environmental pollution, mental health, older people, physical health, quality of life

1 | INTRODUCTION

Aging entails multisystemic changes that reduce the capacity for effort and resistance to physical and mental stress, decreasing autonomy and quality of life.[1] Based on older people's (OP's) perception of aging, social relationships, functional capacity, and daily activities have significantly influenced their quality of life and health status.[2] It has also been observed that men age in better physical, mental, and economic health than women.[3] This is why the aging of the population and its consequences, such as loss of autonomy and independence, are of particular concern to policy-makers worldwide.[4] Therefore, it is crucial to correctly identify the risk factors affecting OP; in this way, the authorities can establish public policies in an informed and efficient manner.[5] Among these risk factors affecting OP, loss of functional autonomy (FA) and the developmental environment stand out as determining variables in the quality of life of this age group.

Concerning the developmental environment, there is evidence showing how exposure to polluted environments decreases the quality of life of OP, regardless of the time of exposure.[6–8] In this context, the World Health Organization (WHO) has shown that the primary sources of particulate matter (PM) with aerodynamic diameter are thermoelectric plants, boilers, industrial processes, furnaces, foundries, and metallurgical processes, among others.[9] In addition, exposure to this PM has been shown to have a high impact and risk to human health, affecting the cardiovascular and respiratory systems.[10] It has even been shown to increase the risk of dementia.[11] In this sense, it has been evidenced that OP ≥ 60 years exposed to high levels of nitric oxide and PMs suspended in the air significantly increased their frailty levels.[6] In addition, research with European OP suggests that exposure to polluted air may negatively affect physical performance in this population.[8] Even more alarming, minimal exposure to PM is associated with an increased mortality risk in countries with restrictive air pollution standards, such as the United States.[7] This background highlights the importance of environmental pollution as a determining factor in the quality of life of OP worldwide. For this reason, it is a priority to identify risk factors and quality of life indicators for this age group.

In Chile, the quality of life for OP is conditioned by two critical factors.[12] First, advances in medicine have increased the life expectancy of human beings.[13] In this regard, the United Nations projects that in 2050, 33% of Chileans will be 60 or older.[14] Despite these encouraging data, a longer life expectancy does not necessarily mean a better quality of life. The second factor conditioning the quality of life of the OP is environmental pollution.[15,16] In this context, the State of Chile has established five sacrifice zones within the country, with the Puchuncaví-Ventanas sector being one of the most affected by industrial pollution.[17] These locations have heavy metal contamination levels that exceed the limits allowed by environmental regulations in developed countries by up to 99%,[17] evidencing, among other situations, soils contaminated by atmospheric deposition of sulfur dioxide and trace elements from the nearby Ventanas Industrial Complex.[15] This environmental pollution (atmospheric and soil) represents a carcinogenic risk factor for the population, mainly due to constant and prolonged exposure to heavy metals.[15,16]

As mentioned above, exposure to polluted environments decreases the quality of life of the OP,[7] increasing their fragility[6] and negatively affecting the physical performance of this population.[8] Also, women show a lower quality of life than men.[3] At the same time, the data show that some Chilean localities have levels of environmental contamination that are dangerous for people's health.[15–17] Despite this problematic situation, no studies have addressed the quality of life and FA of older women (OW) residing in communes with high levels of air pollution in Chile. Consequently, the study aimed to determine Chilean OW's quality of life and FA living in communes, comparing these variables between areas with lower and higher PM in the air. The study hypothesized that the higher the air pollution, the lower the quality of life and the lower the FA.

Key points

- The quality of life and the functional autonomy (FA) of individuals are conditioned by environmental factors present throughout life.
- Exposure to air and soil pollutants decreases the quality of life and FA of older people living in the community.
- Controlling environmental pollution would make it possible to reduce the risk factors that condition people's FA and quality of life.

2 | MATERIALS AND METHODS

2.1 | Design and period

A cross-sectional study was conducted among Chilean Older adults from April to May 2023.

2.2 | Sample size and sampling procedure

For this study, 72 OW were selected purposively. To select the 72 participants, an open call was made. To compare the effect of environmental pollution on quality of life and FA, 36 participants who live in an area with high air pollution level were selected. Similarly, 36 participants who live in an area with low air pollution level were selected purposively. For this division, the interim objective three proposed by the WHO was used, which establishes an annual limit for PM with an aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$) equivalent to 15 µg/m^3 ($PM_{2.5}$ = 15 µg/m^3).[9,18] Based on this, the OW residents in the cities of Valparaíso and Viña del Mar were assigned to the group of "coastal cities with low environmental pollution" or "Zone 1" ($PM_{2.5}$ ≤ 15 µg/m^3), while OW residents in the city of Quintero were assigned to the "coastal cities with high air pollution" or "Zone 2" group ($PM_{2.5}$ > 15 µg/m^3).

2.3 | Inclusion criteria

Being female, aged between 60 and 65 years, living 10 years or more in the communes of Valparaíso, Viña del Mar, or Quintero, having the autonomy to give consent or, otherwise, being represented by a family member or legal representative, and being self-sufficient without risk. However, participants who had preexisting severe cardiovascular conditions or those detected by the electrocardiogram

(ECG) evaluation of the study, severe pulmonary conditions, fractures in the last 3 months, neurodegenerative diseases, severe dementia, physical impossibility to perform any of the proposed tests, having a terminal illness or uncontrolled chronic disease were excluded.

2.4 | Data collection procedure

The data were collected using a structured SF-36v2.0 health questionnaire, GDLAM protocol, and from other test method results. Additionally, FA data were obtained from Bulletin No. 2 157 "Contamination in the Valparaíso Region" of the Center for Research on Innovation, Economic Development and Social Policies.[19] The data were collected in five sessions per participant. The evaluations were performed at an interval of 24 h, considering one session per day. The number of OW evaluated was between 12 and 15 per week (Figure 1).

2.5 | Ethical approval

The study's protocol was approved by the Scientific-Ethical Committee of the Universidad de Las Américas, Chile (registration number: CEC PI_2023003). All procedures of the study were conducted in line with ethical standards under the Declaration of Helsinki (updated in 2013) and the ethical standards for exercise and sports.[20]

2.6 | Electrocardiogram and blood pressure

ECG and blood pressure results were used to safely include the OW in the investigation. However, they were not used as study variables. BP was assessed in the left arm, with the OW in a sitting position, with the left elbow flexed between 125° and 135° and the left forearm resting on a table. A digital monitor (OMRON, model HEM-7120®) was used to assess blood pressure. The resting ECG was performed in the supine decubitus position. A 12-lead digital electrocardiograph with a wireless acquisition module (Mortara, model ELI 230®) was used to perform the ECG.

2.7 | Anthropometry

Body mass (kg) was assessed with a digital weight (TANITA, model InnerScan BC-554®), stature (m) was set with a stadiometer (SECA, model 700®), respecting the Frankfort plane and in maximum inspiration. Both body mass and stature were assessed in underwear. Body mass index (BMI) was calculated by dividing body mass in kilograms (kg) by stature in meters squared (m^2), interpreted according to the adaptation of anthropometric standards for Chilean OP.[21] Body fat percentage was determined by the Ross & Kerr method.[22,23]

2.8 | Quality of life

Quality of life was assessed using the SF-36v2.0 health questionnaire.[24] The SF-36v2.0 health questionnaire is a generic scale that provides a health status profile and can be applied to the general population.[25] This assessment instrument is composed of a total of 36 questions grouped into eight dimensions: (a) 10 questions oriented to physical functioning (PF), (b) four questions oriented to role physical (RP), (c) two questions oriented to bodily pain (BP), (d) four questions oriented to general health (GH), (e) four questions oriented to vitality (VT), (f) two questions oriented to social functioning (SF), (g) three questions oriented to role emotional (RE), and (h) five questions oriented to mental health (MH).[24] The scales of the SF-36v2.0 health questionnaire are ordered so that the higher the percentage obtained in each dimension, the better the health

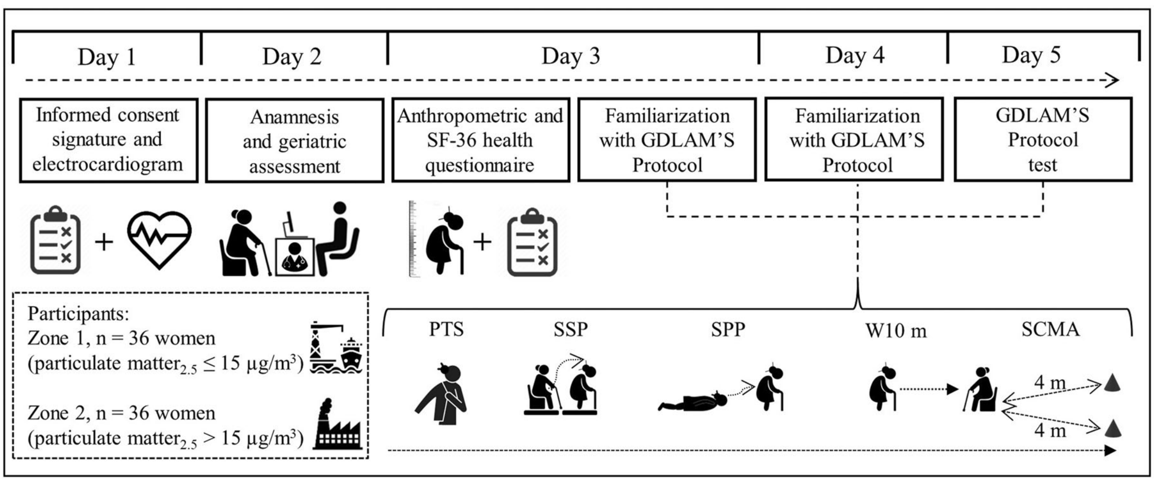

FIGURE 1 Research design. GDLAM protocol, Latin American Group for Maturity protocol; PTS, to put on and take off a T-shirt; SCMA, to sit and get up from the chair and move around the house; SPP, standing up from the prone position; SSP, stand up from sitting position; W10 m, walk 10 m; Zone 1, low-pollution coastal cities; Zone 2, high-pollution coastal cities (sacrifice zone).

status.[26] During the questionnaire application, a trained professional formulated the questions for each participant independently and confidentially; once each response was verbalized, they were entered into a spreadsheet designed for the study. The reliability coefficient calculated using Cronbach's α test for the questionnaire was 0.50 and 0.63 for Zone 1 and Zone 2, respectively.

2.9 | GDLAM protocol

The GDLAM protocol was used to evaluate the FA of the OW.[27–30] This protocol consists of five functional tests: (a) put on and take off a T-shirt (PTS), (b) stand up from the sitting position (SSP), (c) stand up from the prone position (SPP), (d) walk 10 m (W10 m), and (e) sit and get up from the chair and move around the house (SCMA), all of them evaluated in seconds (s) (Figure 1). The five functional tests are described by Huerta Ojeda et al.[31] The results of the five tests are then used to calculate the score point of the GDLAM index of autonomy (GI) using the following formula[28]:

$$GI = [(PTS + SSP + SPP + W10\,m) \times 2] + SCMA]/4.$$

2.10 | Statistical analysis

The anthropometric data from the quality-of-life questionnaire, the five GDLAM tests, and the GI were arranged in a spreadsheet designed for the study. Descriptive data for Zone 1 and Zone 2 are presented as means and standard deviations. The normal distribution of the data was confirmed by the Shapiro–Wilk test ($p > 0.05$). To determine the differences between Zone 1 and Zone 2, the following tests were used: for parametric data, the Student's *t*-test was used, while for nonparametric data, the Mann–Whitney test was used, both for independent samples.[32] All statistical analyses were performed with Prism version 10.0.1 for Windows® software. The confidence interval for all statistical analyses was 95%, while the significance level for all statistical analyses was $p < 0.05$.

3 | RESULTS

The age, body mass, stature, BMI, and fat mass of the OW who participated in the study showed no significant differences between groups ($p > 0.05$). Descriptive data and comparisons between zones are given in Table 1.

When comparing the quality of life between Zone 1 and Zone 2, assessed by the SF-36v2.0 questionnaire and analyzed using the Mann–Whitney test for nonparametric data, it was observed that all eight dimensions are more diminished in Zone 2. In this sense, Zone 2 decreased 8.5% in the PF dimension, 4.1% in RP, 0.1% in BP, 4.4% in GH, 4.3% in VT, 16.0% in SF, 18.0% in RE, and 7.6% in MH. Of these, only the RE dimension was statistically significant (Zone 1: 81.0 ± 21.0%; Zone 2: 63.0 ± 34.4% $p < 0.05$). Figure 2 shows the values of each dimension and the comparisons between zones.

According to international classification standards, the Zone 2 SPP test is classified as "Fair," while the rest of the GDLAM protocol tests and the GI of both groups are classified as "Good."[30] When comparing the FA between Zone 1 and Zone 2, evaluated through the GDLAM protocol and the GI, a lower performance was observed in the five tests executed by the Zone 2 group ($p > 0.05$). Similarly, the score corresponding to the GI of the Zone 2 group was higher ($p > 0.05$), evidencing a lowered FA than Zone 1. The results of each test, the GI, and the comparisons between zones are reported in Table 2.

TABLE 1 Mean values and differences between Zone 1 and Zone 2.

Variables	Zone 1 Mean ± SD min–max	Zone 2 Mean ± SD min–max	Comparison between groups *t*	*p*	Diff ± SEM	95% CI
Age (years)[a]	62.85 ± 1.41	62.61 ± 1.30	0.741	ns	−0.23 ± 0.31	−0.87 to 0.40
	60.0–65.0	60.36–64.62				
Body mass (kg)[a]	70.91 ± 10.05	71.38 ± 15.07	0.157	ns	0.47 ± 3.01	−5.54 to 6.49
	51.8–96.9	47.30–110.2				
Stature (m)[a]	155.3 ± 4.79	153.8 ± 5.74	1.264	ns	−1.575 ± 1.24	−4.06 to 0.91
	146.0–164.0	142.0–169.0				
BMI (kg/m^2)[b]	29.34 ± 3.63	30.18 ± 6.12	—	ns	−0.550	—
	22.8–36.8	21.0–45.3				
Fat mass (percentage)[a]	40.06 ± 4.86	38.95 ± 6.61	0.815	ns	−1.117 ± 1.36	−3.84 to 1.61
	29.3–50.0	24.3–51.5				

Abbreviations: BMI, body mass index; Diff, difference between means; max, maximum; min, minimum; ns, not significant; SD, standard deviation; SEM, standard error of the medians; Zone 1, low-pollution coastal cities; Zone 2, coastal city with high pollution (sacrifice zone).

[a]For the comparison between groups, the *t*-test was used.

[b]For the comparison between groups, the Mann–Whitney test was used.

4 | DISCUSSION

Based on the objective of the study, it was possible to verify that the eight dimensions of quality of life evaluated with the SF-36v2.0 questionnaire are lower in the coastal zone with high environmental pollution, with RE being the only dimension with significant differences between both groups ($p < 0.05$). Likewise, it could be observed that FA evaluated through the GDLAM protocol is lower in the coastal zone with high environmental pollution ($p > 0.05$). These quality-of-life indicators are a warning signal from the OP community living in sacrifice zones.

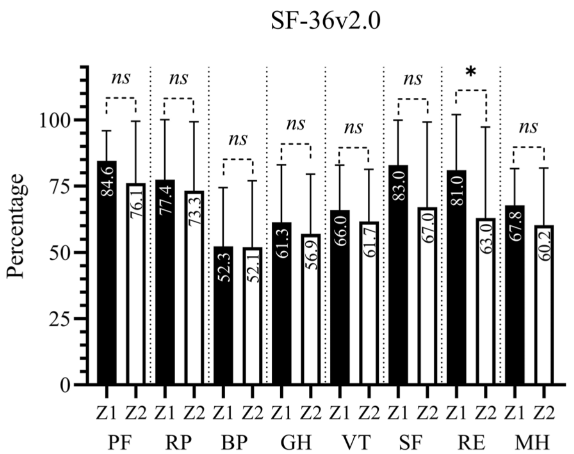

FIGURE 2 Percentages and differences in quality of life between Zone 1 and Zone 2. BP, bodily pain; GH, general health; MH, mental health; ns, not significant; PF, physical functioning; RE, role emotional; RP, role physical; SF, social functioning; VT, vitality; Zone 1, low-pollution coastal cities (particulate matter [PM]$_{2.5}$ ≤ 15 µg/m^3); Zone 2, coastal city with high pollution (PM > 15 µg/m^3). *$p < 0.05$.

4.1 | Quality of life and environmental pollution

Regarding air pollution in the Chilean localities included in this study, a report from the Universidad de Valparaíso showed that both the communes of Valparaíso and Viña del Mar (Zone 1) and the commune of Quintero (Zone 2) complied with Chilean regulations for $PM_{2.5}$ (20 µg/m^3), considering a mixture of solid and liquid particles in the air.[10,19] In 2020, the Valparaíso and Viña del Mar municipalities recorded an annual average of $PM_{2.5}$, equivalent to 12.2 and 12.0 µg/m^3, respectively. Both figures met the standards established in Chilean regulations. At the same time, the commune of Quintero recorded an annual concentration of $PM_{2.5}$ equivalent to 16.6 µg/m^3. This figure also met Chilean regulatory standards but classified Zone 2 as "latent."[19] However, if the $PM_{2.5}$ of the municipalities included in this study had been classified according to WHO standards, all localities would not meet these pollution standards (5 µg/m^3 of PM).[18] The differences in the quality of life and FA between Zone 1 and Zone 2 could be conditioned by the higher PM concentration in suspension between the two locations. In this sense, there is evidence that directly relates PM exposure to cardiovascular and respiratory diseases in the population.[19]

TABLE 2 Results of the GDLAM protocol and the differences between Zone 1 and Zone 2.

Variables	Zone 1 Mean ± SD min–max	Zone 2 Mean ± SD min–max	Comparison between groups *t*	*p*	Diff ± SEM	95% CI
PTS (s)[a]	10.95 ± 2.46	11.15 ± 2.08	—	ns	0.820	—
	6.86–17.62	5.97–18.02				
SSP (s)[b]	8.59 ± 1.40	9.06 ± 1.22	1.498	ns	0.46 ± 0.31	−0.15 to 1.08
	5.09–11.76	6.54–11.34				
SPP (s)[a]	3.38 ± 0.81	3.98 ± 1.62	—	ns	0.510	—
	2.38–5.66	2.41–10.85				
W10 m (s)[a]	5.79 ± 0.79	5.80 ± 0.91	—	ns	−0.270	—
	4.03–7.91	4.12–8.77				
SCMA (s)[a]	35.28 ± 5.16	35.62 ± 5.82	—	ns	−0.505	—
	24.7–47.6	27.7–55.8				
GI (points)[b]	23.19 ± 2.99	23.9 ± 3.63	0.919	ns	0.718 ± 0.78	−0.83 to 2.27
	17.6–30.3	16.8–33.8				

Abbreviations: Diff, difference between medians; GDLAM, Latin American Group for Maturity protocol; GI, GDLAM index of autonomy; max, maximum; min, minimum; ns, not significant; PTS, to put on and take off a T-shirt; SCMA, sit and get up from the chair and move around the house; SD, standard deviation; SEM, standard error of the mean; SPP, stand up from the prone position; SSP, stand up from the sitting position; W10 m: walk 10 m; Zone 1, low-pollution coastal cities; Zone 2, coastal city with high pollution (sacrifice zone).

[a]For the comparison between groups, the Mann–Whitney test was used.

[b]For the comparison between groups, the *t*-test was used.

Specifically, the most degraded dimensions in the quality-of-life assessment were BP, GH, and VT, with nonsignificant differences between zones ($p > 0.05$). Likewise, significant differences were observed in RE between Zone 1 and Zone 2 ($p < 0.05$). In this sense, from the SF-36v2.0 questionnaire, the study participants report a greater intensity of pain and that it affects their usual work, both inside and outside the home; they also report feeling low energy and vitality, with the presence of tiredness and exhaustion. They also perceive poor current and future health, with a greater propensity to get sick.[24] Concerning RE, OW in Zone 2 evidenced more problems with work or other daily activities due to emotional issues than in Zone 1 ($p < 0.05$). In this context, Yamazaki et al.[33] associated the health-related quality of life, in particular the VT and MH dimensions of the SF-36, with ambient concentrations of suspended PM, specifically concentrations of nitrogen oxides (NO_x) and photochemical oxidants (O_x), reporting that people who were exposed to a higher mean concentration of O_x for 2 months scored lower VT or MH ($p = 0.028$). Apart from these alarming figures, it has also become clear that the effects of air pollution can be monitored using questionnaires that assess quality of life, such as the SF-36 questionnaire.[24] In turn, the results of this and other instruments for determining the population's quality of life provide new information for formulating air pollution policies.[24,33]

An even more harmful risk factor for human health is sulfur dioxide (SO_2) concentrations. In fact, unlike $PM_{2.5}$, SO_2 has detrimental effects on people after short exposures.[34] In this regard, the commune of Quintero recorded an annual SO_2 concentration equivalent to 15.7 $\mu g/m^3$, figures within the standards established by Chilean regulations.[34] In addition, in 2021, the WHO published new global air quality guidelines (10-min and 24-h SO_2 concentrations).[18] In this context, under the SO_2 standards established by the WHO, the population of Quintero is at high health risk. In addition, there is evidence that the soils of Quintero and other nearby localities contain heavy metals and trace elements from Ventana's Industrial Complex,[15] a situation that represents a carcinogenic risk factor for the community.[15,16] Considering that the environmental situation in the Quintero commune is critical, it is essential to remember that the risk for people living in this area ranges from low quality of life or deterioration of FA to a higher risk of mortality.[7]

4.2 | FA and environmental pollution

FA is closely linked to physical performance, which may be conditioned by risk factors such as environmental pollution.[8] In this sense, De Zwart et al.[8] related air pollution (NO_x, nitrogen dioxide, and suspended PM) to PF in OP in the Netherlands, concluding that exposure to polluted air can negatively affect the physical performance of OP. The next stage of FA loss (loss of physical performance) is increased frailty. Veronese et al.[6] investigated the relationship between air pollution and frailty in OP ≥ 60 years in this context. At the end of the study, the researchers concluded that exposure to NO_x and other suspended PM increases the likelihood of frailty in this age group.[6] Frailty is the prelude to physical dependence, and this, in turn, is the stage before mortality. Concerning mortality and atmospheric pollution, Di et al.[7] found that a daily increase of 10 $\mu g/m^3$ in fine PM and a daily increase of 10 parts per billion in ozone exposure in the warm season were associated with an increase of 1.42 and 0.66 deaths per million people at risk per day, respectively. This evidence certifies that Chilean OP residing in coastal cities with high air pollution (Zone 2) are likelier to have decreased FA, increased frailty, and increased mortality risk than OP living in locations with lower air pollution. Scientific evidence has reported that the localities of Puchuncaví and Ventanas in Chile (including the commune of Quintero) present extremely high pollution levels for people's health.[17,19,34] Perhaps this level of environmental contamination is one of the risk factors that triggered a decrease in the FA levels of Zone 2 OW. In practice, all five GDLAM and GI protocol tests were lower in Zone 2 compared to Zone 1 ($p > 0.05$), a situation that could be the prelude to frailty and dependence in this age group. Consequently, to maintain and improve FA and, thus, quality of life, the authorities should reevaluate the allowable environmental pollution standards and generate palliative policies for OP living in these communities, especially in sacrifice zones.[7]

4.3 | Limitations

A limitation of the present study was the lack of $PM_{2.5}$ measurements in the communes of Valparaíso and Viña del Mar (Zone 1) and Quintero (Zone 2). Also, the presence of PMs in the blood of the OW who participated in the study was not evaluated. The lack of $PM_{2.5}$ measurements in the three communes and the lack of evaluation of PMs in the blood of the OW prevented a direct association between pollutants with quality of life and FA. Despite this, the findings presented in this research are the first to relate the variables described. They will help raise awareness about pollution's harmful effects in the communities. Further on, four dimensions of quality of life (BP, GH, VT, and RE) were included in discussing the results. In comparison, the remaining four dimensions (PF, RP, SF, and MH) were not included due to a lack of information relating environmental pollution to the quality of life assessed with the SF-36v2.0 questionnaire.

5 | CONCLUSIONS

In the present study, OW from coastal areas with high air pollution showed lower quality of life and FA compared with OW from coastal areas with lower air pollution. Therefore, the suspended PM could condition physical health and MH and the population's quality of life. Finally, under the standards established by the WHO for the concentration of suspended PM and heavy metals in air and soil, the communes evaluated in this study showed a high health risk, especially the commune of Quintero.

6 | RECOMMENDATIONS AND FUTURE RESEARCH

The authorities must adjust the regulatory framework for environmental pollution in all localities of the territory, especially in localities close to industrial complexes.[7] Along with these regulatory adjustments of pollutants, government policies should be generated to maintain and improve the FA of the OP living in the community. In this way, it can improve the quality of life of the OP residing in the communities. This condition is highly affected by air and soil pollution. Likewise, future studies relating environmental pollution to quality of life and FA in OP should include assessments of PM in suspension and the presence of heavy metals in blood, associating them with all the quality-of-life dimensions of the SF-36v2.0 questionnaire and FA assessed by the GDLAM protocol.

AUTHOR CONTRIBUTIONS

Álvaro Huerta Ojeda: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing—original draft; writing—review and editing. **Emilio Jofré-Saldía**: Conceptualization; methodology; visualization; writing—original draft; writing—review and editing. **Guillermo Barahona-Fuentes**: Conceptualization; data curation; resources; visualization; writing—original draft; writing—review and editing. **María-Mercedes Yeomans-Cabrera**: Conceptualization; visualization; writing—original draft; writing—review and editing. **Maximiliano Bravo**: Conceptualization; data curation; validation; writing—original draft; writing—review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

All the relevant data and information will be available from the corresponding author upon reasonable request.

TRANSPARENCY STATEMENT

The lead author Álvaro Huerta Ojeda affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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