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Study of Loneliness and Pulmonary Disease in Older Adults in Residential Care Facilities

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Dissertação para obtenção do Grau de Mestre em
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Dedication

Dedico esta dissertação a todos os idosos que tive o prazer de conhecer durante a realização deste trabalho. Sem eles nada disto tinha sido possível.

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Resumo Alargado

Introdução; A solidão pode ser definida como um estado subjetivo que ocorre quando existe uma discrepância entre as relações sociais desejadas e as reais, que são percebidas como insuficientes quer em quantidade e, particularmente, em qualidade, levando a sentimentos indesejáveis [1–3]. Esta, no entanto, não deve ser confundida com o isolamento social, apesar de se encontrarem relacionados, uma vez que se refere a ausência ou afastamento objetivo dos outros, podendo ou não conduzir a um estado emocional negativo [1, 3, 4].

A solidão encontra-se relacionada com diversos problemas de saúde, como causa e como a consequência deste [5]. Os adultos idosos, que geralmente se consideram que pertencem a este grupo quando têm 65 ou mais anos [6, 7], devido a várias alterações relacionadas com a idade, tais como a perda de pessoas próximas, têm maior risco de solidão [3, 5, 8].

O envelhecimento encontra-se, frequentemente, associado a patologias, algumas geradoras de dependência ou outras condições que podem implicar o recurso a Estruturas Residenciais para Pessoas Idosas (ERPI's). Apesar destas estruturas serem uma solução para preservar a saúde física e garantir medidas de segurança desta população, têm frequentemente dificuldade em responder às complexas exigências psicológica dos residentes, nomeadamente à solidão [9]. Para impedir a transmissão da infeção por SARS-CoV-2, várias medidas de saúde pública foram implementadas, tais como o distanciamento social e a quarentena [10, 11]. Estas medidas levaram a um agravamento da solidão, tendo estudos comprovado um aumento destes sentimentos nos mais velhos [12–15]. É de salientar que apesar de terem passado alguns anos desde o início da pandemia da COVID-19, os seus efeitos ainda se fazem sentir hoje em dia, com muitos ERPI's a manterem restrições nas suas políticas de visitas, levando a uma permanência dos sentimentos de solidão [16].

Um dos principais responsáveis pela morbilidade e mortalidade das pessoas idosas é a doença pulmonar, constatando-se que a sua incidência tem vindo a aumentar com o envelhecimento da população [17]. Isto deve-se não só ao processo de envelhecimento natural mas também à sua interação com a exposição ambiental [17–19]. Relativamente à relação entre estas patologias e a solidão, a maioria dos estudos constata que existe uma associação positiva entre estes, particularmente entre a solidão e a Doença Crónica Obstrutiva Pulmonar [2, 20–25]. No entanto, um estudo de coorte não observou tal relação, apenas verificando que a solidão é um fator de risco para esta doença [26]. Para além disso, estudos descrevem como esta associação resulta num aumento das visitas aos serviços de urgência, pior perceção da saúde, sentimentos de falta de apoio, maior multimorbilidade e na deterioração da capacidade funcional e da qualidade de vida quando a solidão agrava [2, 22–25].

O objetivo deste trabalho é analisar a solidão em residentes de ERPI's com doenças pulmonares (Doença Pulmonar Obstrutiva Crónica, Asma, Bronquite, Síndrome da Apneia

Obstrutiva do Sono e Doença Pulmonar Restritiva), na região de Leira, Portugal tendo em consideração variáveis sócio-demográficas, perceção de suporte social, grau de atividade física, sintomas psicopatológicos, grau de autonomia nas atividades de vida diária e as atividades proporcionadas pelas ERPI's.

Métodos: Este estudo enquadra-se num estudo mais amplo sobre solidão, aprovado pela Comissão de ética da UBI (CE-UBI-Pj-2022-077). Os dados foram recolhidos em agosto de 2023 através de entrevistas presenciais, nas quais se aplicaram vários instrumentos. O Mini-Mental State Examination (MMSE) permitiu rastrear a possibilidade de défice cognitivo, segundo os pontos de corte estabelecidos em função das habilitações literárias dos respondentes [27]; A UCLA Loneliness Scale Version 3 (UCLA-3), para avaliar os níveis de solidão, permitindo classificar a s solidão em níveis baixos, moderados e elevados [28]. No que diz respeito ao apoio percecionado pelo participante por parte da família, amigos e outras pessoas significativas, este foi medido através da Multidimensional Scale of Perceived Social Support (MSPSS). As pontuações variam entre 1 e 7 para cada grupo de apoio, sendo que pontuações mais elevadas indicam uma maior perceção de apoio [29]. Para avaliar os sintomas psicopatológicos de depressão, ansiedade e somatização foi utilizado o Brief Symptom Inventory (BSI-18). Pontuações mais elevadas indicam sintomas psicopatológicos mais relevantes [30–32]. Relativamente à versão curta do International Physical Activity Questionnaire (IPAQ), esta avalia a intensidade da atividade física e o tempo de repouso dos participantes nos últimos sete dias. Esta pode ser classificada em atividade física vigorosa, moderada ou baixa [33, 34]. O Barthel Index for Activities of Daily Living (BI) avaliou a capacidade dos participantes para realizarem as atividades da vida diária, podendo ser categorizado em cinco níveis de dependência, desde dependente total a independente [35]. Foram também colocadas questões sociodemográficas e sobre a saúde dos participantes, nomeadamente em relação à existência de doença pulmonar.

Dos 75 participantes que constituíam a amostra inicial, apenas 67 (89.30%) cumpriram os critérios de inclusão, que eram ter 65 anos ou mais, viver numa ERPI em Leira e não ter défice cognitivo, de acordo com o MMSE. Para a análise estatística foi utilizado o software SPSS. v28. A idade média dos participantes foi 82.160 ± 9.501 anos, sendo que mais de metade eram do sexo feminino (64.20%). A maioria era viúvo e nunca tinha frequentado a escola ou tinha 4ª classe. A doença pulmonarestava presente em 15 participantes (22.40%).

Resultados: Os resultados obtidos indicam níveis moderados a elevados de solidão, com 5 (7.4%) e 62 (92.54%) participantes respetivamente. Pelo teste exato de Fisher, concluímos, ao nível de significância de 5%, que não existe associação entre o grau de solidão e a presença de patologia dos pulmões, concluindo-se também, pelo teste do Qui-quadrado, que a existência de doença pulmonar é independente do género, da área de residência prévia e se estavam institucionalizados na sua área de residência prévia.

O cálculo do coeficiente de correlação de Pearson indicou que a solidão (UCLA-3) e os sintomas psicopatológicos de depressão e somatização (BSI-18 Depressão e Somatização),

bem como os três sintomas psicopatológicos de depressão, somatização e ansiedade, avaliados pelo BSI-18, apresentam uma correlação linear significativa moderadamente positiva. No entanto, o apoio social percecionado pelo indivíduo (MSPSS) e os sintomas psicopatológicos (BSI-18) apresentam uma correlação linear significativa moderadamente negativa. O mesmo não aconteceu com o coeficiente de correlação ponto-bisserial, que não encontrou nenhuma associação significativa com a solidão como com a doença pulmonar.

Discussão: Este estudo debruça-se sobre uma população clínica específica – com doença pulmonar - e a residir em ERPI alertando, em primeiro lugar para níveis alarmantes de solidão sentida, apesar de não terem sido constatadas diferenças significativas entre os doentes com e sem doenças pulmonares. A solidão resulta da interação de múltiplos fatores e agrava as condições clínicas. Sendo a solidão um fator de risco [22] e uma fonte se sofrimento psicológico. A interpretação dos resultados, requer, contudo, que se tenha em consideração que se trata de uma amostra de conveniência de tamanho reduzido, especialmente em termos de participantes com patologia respiratória.

Os resultados indicam que o estado civil e contexto social influenciam a solidão, constatando-se que mais de metade dos participantes eram viúvos e apresentavam níveis elevados de solidão. Este resultado corrobora estudos prévios que mostram que o casamento é um fator protetor e que a perda do cônjuge está associada a um aumento da solidão [3, 20, 36, 37]. Adicionalmente, outros estudos salientaram também o impacto negativo que a perda de outros entes queridos, estar sozinho, sem ninguém para cuidar deles, e limitações físicas, adquiridas naturalmente pela idade ou associadas a patologias individuais, podem ter na solidão, exacerbando-a [36–39].

No caso específico das ERPI's, estudos mostraram como as relações superficiais estabelecidas entre os utentes com outros utentes ou funcionários, capacidades cognitivas díspares entre os utentes, perda de autonomia associada à falta de controlo nas suas próprias vidas e na tomada de decisões e a falta de objetivos parecem estar associados a um agravamento da solidão [9,36]. Contudo, é essencial referir que este estudo não abordou estes fatores que será importante investigar noutros estudos, para se identificarem aspetos práticos a trabalhar e promover nas ERPI's que possam reduzir a solidão.

É também crucial ter em conta que a população deste estudo possuía outras patologias, desde físicas a psicológicas, para além das respiratórias. Embora estas não tenham sido avaliadas, isso não significa que não influenciem a solidão uma vez que, tal como foi indicado por vários estudos, a solidão está associada a um aumento de sintomatologia psicológica e a efeitos adversos na saúde física, com um aumento de doenças crónicas, limitações funcionais e diminuição da qualidade de vida geral [3, 20, 37, 38, 40].

Estudos indicam que ser mulher [3, 20, 38] e ter baixos níveis de escolaridade [20, 36, 37] estão ligados à solidão. No entanto, estes resultados não foram observados no presente estudo. Constatou-se que não existia associação entre o sexo e a solidão, indo con-

tra o encontrado na literatura. Já os dados relativos à literacia não reuniram condições necessárias para a aplicação do teste estatístico adequado. O tamanho reduzido da amostra e o facto desta se tratar de uma população tão específica, poderá estar relacionado, e ter limitado, os resultados observados.

Como foi anteriormente referido, certas variáveis quantitativas tiveram uma correlação linear moderadamente significativa. A UCLA-3, correlacionou-se positivamente com o BSI-18 Somatização e Depressão, o que apoia o que foi referido a sobre a solidão e a sua associação com sintomas psicológicos [3,20]. Já a MSPSS, que mede o apoio social percecionado pelo indivíduo, está inversamente relacionada com todos os parâmetros avaliados pelo BSI-18 (correlação linear significativa moderadamente negativa), sendo que uma maior perceção de apoio está associada a menos sintomas de depressão, somatização e ansiedade. Isto está em concordância com a literatura [41–44]. Por fim, constatou-se que todos os parâmetros do BSI-18 estavam mutuamente positivamente correlacionados, algo expectável uma vez que pertencem à mesma escala e que existe sobreposição de sintomas associados a cada parâmetro, podendo estas patologias serem comórbidas [45,46].

Constatou-se, ainda, que os participantes com níveis moderados de solidão apresentavam menores valores de apoio social quando comparados aos participantes com níveis elevados de solidão. Este dado vai contra o encontrado na literatura, que associa, em idosos em ERPI's, um aumento dos sentimentos de solidão com um défice no apoio social e viceversa [47]. Este resultado ilustra a complexidade da solidão que poderá não estar relacionada com o apoio social que a pessoa perceciona. O sentimento de solidão é de facto, mais do que a existência e perceção de apoio, estando mais relacionado com um desfasamento entre o que a pessoa deseja ter e perceciona ter. Contudo, mais uma vez, há que ter em consideração a dimensão da amostra e que esta diferença não foi significativa, pelo que não se deve generalizar este resultado.

Em suma, este estudo focou-se na importância de analisar a solidão e a sua relação com a saúde e qualidade de vida em idosos residentes em ERPI's com doenças pulmonares. Foram constatados níveis alarmantes de solidão que devem ser abordados juntamente com as doenças respiratórias. Contudo, não foi encontrada uma associação entre a solidão e as patologias respiratórias nesta população, possivelmente devido à não aleatoriedade da amostra e ao facto de se tratar de uma população particular com outras patologias. Este estudo realça a necessidade de estudos que se foquem nesta população específica e que tenham em conta múltiplas outras variáveis. Os resultados revelam, ainda a urgência de promoção de medidas de redução da solidão e da necessidade de cuidados interdisciplinares abrangentes aos utentes de ERPI's bem coordenados e de formação e especialização em geriatria e gerontologia que possam intervir e desenhar medidas que possam reduzir a solidão nos residentes em ERPI's.

Palavras-chave

Solidão;Doenças pulmonares;Idosos;Estruturas residenciais para pessoas idosas

Abstract

Purpose: This study aims to inquire about and assess the relationship between loneliness and pulmonary diseases (COPD, Asthma, Bronchitis, Obstructive Sleep Apnea Syndrome and Restrictive Lung Disease) in residents of residential care facilities in the region of Leira, Portugal, taking into account various socio-demographic variables, the perception of social support, the degree of physical activity, psychopathologic symptoms, the degree of performance in daily life activities and activities provided by the facilities.

Methods: Data were collected in August via face-to-face interviews using a questionnaire composed of numerous scales, in addition to social-demographic questions and access to the participants' clinical records. To be enrolled in this study participants had to be 65 years or older, live in a RCF in Leira and not have cognitive impairment, according to MMSE. All the data analysis was performed with SPSS v28.0 statistical software.

Results: Of the initial 75 participants, 67 (89.30%) met the inclusion criteria to the study. The mean age of the sample was 82.160 ± 9.501 years and more than half were female (64.20%). Moderate to high levels of loneliness were shown in all the participants. Pulmonary disease was present in 15 participants (22.40%). Fisher's exact test indicated no association between the degree of loneliness and the presence of pulmonary disease at a 5% significance level.

Moreover, the Chi-square test concluded that the severity of loneliness and the presence of lung disease were independent of gender, area of previous residence, and whether they were institutionalized in their area of prior residence. While Pearson's correlation coefficient indicated that certain quantitative variables have a fair significant linear correlation, this was not the case with the point-biserial correlation coefficient.

Conclusion: This study focused on the importance of analyzing loneliness and its relationship with health and quality of life in the elderly living in RCF with lung diseases. Although no association was found between loneliness and respiratory pathologies in this population alarming levels of loneliness have been observed and need to be addressed along with respiratory diseases. This study also highlighted the need for comprehensive and well-coordinated interdisciplinary care and specialized training and expertise in geriatrics.

Keywords

Loneliness, Pulmonary Disease, Residential Care Facilities, Elderly

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List of Acronyms

ERPI	Estrutura residencial para pessoas idosas
COPD	Chronic Obstructive Pulmonary Disease
INE	Instituto Nacional de Estatística
HQoL	Health quality of life
RCF	Residencial Care Facilities
MMSE	Mini-Mental State Examination
UCLA-3	UCLA Loneliness Scale Version 3
MSPSS	Multidimensional Scale of Perceived Social Support
BSI-18	Brief Symptom Inventory 18
IPAQ	International Physical Activity Questionnaire
BI	Barthel Index for Activities of Daily Living

Introduction

According to the World Health Organization, health can be defined as *"A resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities."* [48]. The social factors that influence health outcomes are known as social determinants of health [49–51].

One of the former's core factors is loneliness. Loneliness can be defined as a subjective state of mind that occurs when there's a discrepancy between one's desired and actual social relationships, which are perceived to be less in quantity and, particularly, in quality, leading to undesirable feelings [1–3]. This state of mind can happen, for example, when an individual is at a social place or events, like school or dinner, surrounded by people or even friends, and still feels alone, thus experiencing loneliness.

While loneliness is often associated with isolation due to the common aspect of social disconnection, they are not interchangeable. Isolation is an objective physical state of separation or detachment of an individual from others. It may or may not lead to a negative emotional state, as it might be a voluntary choice [1,3,4]. An example of this state is an individual who is separated from others due to medical reasons or chooses to be isolated to pursue some personal interest. Overall, people can be alone and not feel lonely as people can be encompassed by others and experience loneliness [1,4].

1.1 Loneliness and Health

Loneliness has been connected to a diverse set of health outcomes, illustrated by a decrease in physical and mental health, an increased number of hospital admissions, lower medication adherence, poorer health perception, more laborious recoveries and a higher incidence of mortality and morbidity [3, 21, 23, 38, 40, 52]. As a matter of fact, both loneliness and health outcomes have each taken the role of the contributor or the result of the other [5].

Health outcomes, for instance, impairments in hearing or vision, reduced mobility, or dyspnea, can lead to a decrease in time spent outside the household and the inability to properly engage in relationships and activities, resulting in loneliness [2,5,23,25,37]. On the other hand, loneliness is linked to an increase in depressive and anxious symptomatology and stress levels, lower self-esteem, and poorer lifestyle behaviours, like smoking or overconsumption of alcohol, but also impairment of the neuroendocrine, cardiovascular, and immunologic systems [3, 20–22, 40, 49, 52]. This can all contribute to worse health outcomes [3, 25, 26, 52, 53]. Regardless of which one is the contributor, the result will lead to the worsening of the first, creating a never-ending cycle if not put to a stop [2,3,5,8,20,38,52,53].

Concerning some of the results of the association between loneliness and the prevalence of diseases, as aforementioned, multiple studies have linked loneliness to an increase or worsening of numerous diseases and their health consequences. For example, a Dutch study revealed that individuals who experienced loneliness had a higher likelihood of developing clinical dementia across a span of three years in comparison with the ones who did not report it [38], while a meta-analysis, also related to dementia, stated a risk of 1.58 higher for individuals without a social network [8].

Regarding respiratory diseases, Theeke *et al.* showed that patients with pulmonary diseases exhibited more significant levels of loneliness, which also positively correlated with the total number of chronic conditions [2]. Furthermore, Agarwal expressed that Chronic Obstructive Pulmonary Disease (COPD) patients experience more elevated rates of loneliness compared to individuals without COPD, with this sense of loneliness also extending to their spouses, and that a greater incidence of asthma is connected to feelings of loneliness [20].

1.2 Loneliness and Aging

Equally important is the definition of an older adult, who is generally considered to be an adult aged 65 or over [6, 7]. This specific population, whose numbers are growing each year, has a higher risk of loneliness due to multiple age-related changes, such as illness and the departure of close ones [3, 5, 8]. According to the Portuguese National Statistics Institute (INE), in 2022 there were 2,507,922 adults aged 65 or over in Portugal, corresponding to 24.00% of the resident population [54]. This was an increase compared to the previous years, making Portugal one of the countries with the largest percentage of older adults worldwide [55–57].

Ageing is associated, as mentioned above, with multiple age-related changes, such as difficulties with mobility, hygiene and dressing [58, 59]. These changes, in turn, lead to increased needs and a rise in specific care for this population [18, 58]. This care is sometimes provided by family members, especially their children [58, 60]. However, the role of the informal caregiver does not come without its health risks and is associated with a negative impact on health [58, 60]. Nevertheless, it is essential to remember that not all elderly people have family members willing or able to look after them, or even living relatives, making RCF their only solution. Whereas care homes play an essential function in preserving the physical health and safety demands of this specific population, they, generally, aren't ready to respond to the intricate social and psychological requirements, which include the prevention of loneliness [9].

Gardiner *et al.*, through a meta-analysis, found results that imply that loneliness is prevalent and a relevant problem among those who live in care facilities, with four studies showing that the levels of loneliness were substantially more significant in those who reside in

healthcare centers than those who lived at their properties. Trivial relationships and disparities in cognitive capacities between residents, lack of control and decision-making of their lives and passive activities contribute to loneliness [9].

The COVID-19 disease pandemic started in early December of 2019 and brought many changes to our lives. To stop the spreading of this infectious disease, strict and preventive public health measures were implemented, some of which were social distancing and quarantine [10, 11]. These measures played a critical role in the experience of feeling lonely, especially in the older community [12]. Studies conclude that the pandemic did adversely influence older people's loneliness, with the rates of loneliness being higher during the pandemic compared to previous years [12–15]. Considering the relationship between loneliness and older adults in residential care facilities during the pandemic, studies have determined that, during this period, these individuals felt an increment in their loneliness rates in line with the evolution of the pandemic [13,55,61]. Therefore, taking into account the repercussions on health and the current demographic trend, loneliness is a problem that needs to be urgently tackled [5].

1.3 Pulmonary Disease and Aging

Lung diseases, continue to be prominent contributors to morbidity and mortality, not just in Portugal but worldwide [62]. In 2019, they ranked as the third leading cause of death in Portugal. However, the Sociedade Portuguesa de Pneumologia forecasts that by 2030, they will occupy the first place [63]. They were responsible for 13305 (11.70%) deaths in Portugal in 2018, of which 2834 were due to COPD [60].

The incidence of lung diseases has been increasing with the ageing of the population, as stated by Ascher *et al.*, *"As the percentage of persons more than 65 years old increases worldwide so does the incidence of lung disease"* [17]. This is further supported by numerous studies that have concluded that, for example, *"chronic obstructive pulmonary disease (COPD) predominantly affects older adults"* [21] and *"respiratory infections, and these are highly prevalent in older persons"* [19]. Hence, it is imperative to take into consideration the process of lung aging and its complexity [64].

The lungs' natural aging process is outlined with multiple *"molecular and physiological changes"* [64], such as cellular senescence, epigenetic alterations, nutrient sensing, changes in the collagen fiber network, decreased respiratory muscle mass, decreased chest wall compliance and many others [17, 18]. The changes lead to modifications in the function of the lungs and their protective repair mechanisms and, consequently, a higher propensity for the development of chronic respiratory diseases [19, 64]. However, there is also the need to highlight that many pulmonary diseases are multifactorial and do not depend solely on natural lung ageing processes. Environmental exposure plays an essential role, particularly in people of advanced age ($\geq$ 65 years), due to the constant and

chronic exposure to air pollution, occupational dust, tobacco smoke and other gases and particulates [18]. As a result, these conditions make this demographic group more liable to damage to cellular function and hasten the ageing process [65]. Generally, it is possible to derive that "pulmonary function impairment is a predictor for morbidity and mortality and may promote the development of multiple disease processes" [19].

1.4 Loneliness and Pulmonary Disease

Once again, broaching the topic of loneliness, manifold studies have displayed strong evidence that loneliness increases mortality [3, 21, 25, 52]. Moreover, they established a meaningful association between loneliness and the prevalence of many chronic diseases and their outcomes, including respiratory diseases [22, 37, 66]. This association is further supported by the knowledge that these illnesses are multifactorial, more notably in older people due to geriatric conditions, namely polypharmacy, multimorbidity and social frailty [21, 65]. In short, multiple factors can *"misidentify or modify disease diagnoses, in this specific case respiratory diseases, and their clinical course in older adults"* [21], with loneliness being one of them.

The vast majority of studies that address the relationship between loneliness and chronic illnesses, focus on cardiovascular diseases and out of the studies that approach respiratory diseases, these mainly broach COPD, whereas some talk about pulmonary diseases in general [21, 22, 24, 25, 66]. Overall, studies report in adults a positive association between loneliness and lung conditions, mainly COPD, with people bearing these conditions presenting higher levels of loneliness and more diseases, *"especially when compared with the general age-matched population"* [2, 20–25]. Petitte *et al.*, through a systematic review, found some studies where patients with COPD, as well as their spouses, had levels of loneliness ranging from moderate, moderately high, and high [22]. Penninx *et al.* went as far as stating that people with these illnesses have *"a higher risk of feelings of loneliness"* and experience *"more severe loneliness"* when compared with other chronic diseases [24]. As for Leigh-Hunt *et al.*, they observed that although there was an association between COPD and loneliness, the evidence was not as strong as that presented by cardiovascular diseases [21]. However, a prospective cohort study by Christiansen *et al.* found no evidence predicting the association between loneliness and COPD, though it did find that loneliness increased the risk of this disease [26].

Regarding this relationship with older people, Witt *et al.* found in their study that COPD patients were lonelier than those without COPD, with a prevalence of 57.70% and 42.10%, respectively [23]. Furthermore, studies describe how this association results in increased visits to emergency departments, poorer perception of health, feelings of low support, higher multimorbidity and deterioration of functional capacity and HQoL (Health quality of life) when the loneliness worsens [2, 22–25].

1.5 Aims of the Study

All in consideration, it seems necessary to tackle the emerging issue that loneliness has become, specifically for senior citizens, due to its significant role and outcomes in chronic illnesses and, consequently, health [24]. Thus, this study aims to inquire about and assess loneliness in elderly people living in Residential Care Facilities (RCF) in the region of Leira, Portugal and analyze its relationship with pulmonary diseases (COPD, Asthma, Bronchitis, Obstructive Sleep Apnea Syndrome and Restrictive Lung Disease), taking into account various socio-demographic variables, the perception of social support, the degree of physical activity, psychopathologic symptoms, the degree of performance in daily life activities and activities provided by the facilities.

Methods

2.1 Overview, Study Design and Data Collection

This study is linked to research project titled *"Solidão em Adultos residentes na ilha de São Miguel (Açores)"* (CE-UBI-Pj-2022-077) that began in 2021. In contrast, the present study, initiated in 2023, focuses on assessing the loneliness and pulmonary diseases in older adults in residential care facilities in Leiria, Portugal.

In June, five residential care facilities (RCF) (Santa Casa da Misericórdia da Marinha Grande, Santa Casa da Misericórdia da Batalha, Centro Hospitalar de Nossa Senhora da Conceição, Associação de Bem Estar e Ocupação de Tempos Livres de Pataias e Academia Cultural e Social de Maceira), arbitrarily chosen among the existing RCF in Leiria, were contacted and accepted to be part of this study. Afterwards, the facilities got the relatives to consent to the seniors' participation. The data collection took place in August via face-to-face interviews. In these interviews, the participants answered a questionnaire composed of numerous scales, with the data registered in Google Forms. To meet the inclusion criteria, participants must be 65 or older and live in a residential care facility in the Leiria Region. Additionally, according to the Mini-Mental State Examination (MMSE), they must not have cognitive impairment.

2.2 Measures

As previously mentioned, multiple scales were used in the questionnaire. The Mini-Mental State Examination (MMSE), developed by Folstein & McHugh (1975) and adapted to Portuguese from Guerreiro *et al.* (1994), was used to check the participants' cognitive state. This exam consists of thirty questions, each awarded one point, for a total of thirty points. The cutoff used to exclude any individual with cognitive impairment was 22 for a literacy of 0 to 2 years, 24 for a literacy of 3 to 6 years or 27 for a literacy equal to or greater than 7 years [27]. Moreover, the UCLA Loneliness Scale Version 3 (UCLA-3), by Russel (1996) and validated for the Portuguese population by Zeas-Sigüenza, Oliveira, Ferreira, Ganho-Ávila, Vagos & Ruisoto (2021), was utilized to ascertain the extent of loneliness. This scale has twenty questions that can be answered with four possibilities: never, rarely, sometimes, and often. A score of 80 is the highest, and 20 is the lowest score possible. Although this is a numerical scale, it can be grouped into categories. A total score lower than 28 indicates no to low levels of loneliness, a score between 28 and 43 shows moderate loneliness, and a score above 43 reveals high levels of loneliness [28]. The Multidimensional Scale of Perceived Social Support (MSPSS), created by Zimet, Dahlem, Zimet & Farley (1988) and translated to Portuguese by Carvalho, S. (2006), assessed an individ-

ual's perceived support from family, friends, and a significant other. It consists of twelve questions, four for each source of support, that can be answered with seven different responses. The result of each support group is obtained through the average points of the answers of that specific group, ranging from 1 to 7. The total social support is the mean of all the twelve responses, with the minimum being 12 and the maximum being 84. Increased scores correlate with greater levels of support [29].

Furthermore, the Brief Symptom Inventory (BSI-18), establish by Degoratis (2001) and verified for the Portuguese population by Nazaré, Pereira & Canavarro (2015), is an eighteen-item scale that appraises the psychopathological symptoms of depression, anxiety, and somatization. It also measures the overall distress level through the Global Severity Index. This eighteen-item scale can be divided into three six-item groups according to the symptom, with five rating points. The score for each group ranges from 0 to 24, while the Global Severity Index, given by the overall score, ranges from 0 to 72. Higher scores indicate more significant psychopathological symptoms [30–32]. Using the short form of the International Physical Activity Questionnaire (IPAQ), validated by Craig *et al.* (2003) and adapted in Portuguese by Barretta *et al.* (2007) and Viebig *et al.* (2006), the participants' intensity of physical activity and rest time in their daily lives over seven days were assessed using seven questions. They can be scored in three categories: vigorous physical activity, moderate physical activity or low physical activity, being measured in minutes and days [33, 34].

Regarding the socio-demographic questionnaire, information on gender, age, marital status, place of residence, birthplace, literacy, current care facility and activities performed through the facility were obtained. Additionally, to determine an individual's capacity to perform daily life activities, the Barthel Index for Activities of Daily Living (BI), developed by Mahoney & Barthel (1965) and validated in Portuguese by Sequeira (2007), was used. The ten questions that make up this quantitative scale were commented on by the nurses and other workers in the establishment who knew the participants well. The scores range from 0 to 100 and it can categorize participants into five different groups based on their dependency levels: a score of 20 or lower equals total dependency, 21 to 60 severe dependency, 61 to 90 moderate dependency, 91 to 99 very low dependency, and 100 independence [35]. Finally, the participant's state of health was also questioned, particularly about the existence of lung disease.

2.3 Data Analysis

All the data analysis was performed with SPSS v28.0 statistical software. While relative frequencies were used for categorical variables in the descriptive analysis, minima, maxima, averages, and standard deviations were used for the continuous variables. Both Fisher's exact test and the Chi-square test were used to study the association between the

severity of loneliness and the categorical variables (gender, civil status, literacy, previous area of residence, institution in last area of residence, IPAQ, number activities and BI), as well as those of the latter with the existence of lung diseases. Moreover, the non-parametric Mann-Whitney test was used to investigate distributional differences between the groups. Pearson's correlation coefficient was used to analyze the linear relationship between quantitative variables. As for the correlations between quantitative and dichotomous variables (severity of loneliness and presence of lung disease), the Point-Biserial Correlation Coefficient was used. For all the tests, a 5% significance level was considered.

Results

3.1 Descriptive Analysis

From the initial 75 participants included in the study, 67 (89.30%) met the inclusion criteria. Therefore, the sample used in this study has a dimension of 67. Of the 67 senior citizens, 43 were female (64.20%), the youngest participant was 65 years old, and the oldest was 102, with a mean age of 82.160 ± 9.501 years. Most of the participants were widowed, 36 (53.70%), and never attended school or only finished primary school, as seen in Figure 3.1. Moreover, 14 (20.90%) were married, 9 (13.40%) were single, and 8 (11.90%) were divorced.

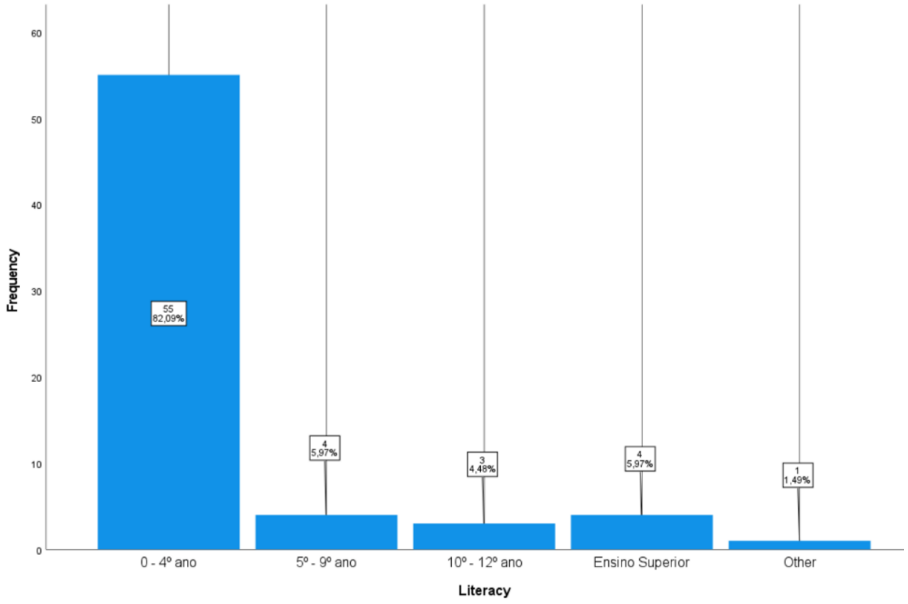

Figure 3.1: Frequency distribution of academic qualifications of participants (n=67)

Pulmonary diseases were present in 15 (22.40%) participants (13 participants (19.40%) had one disease and 2 (3.00%) had two diseases).

Participants with and without pulmonary diseases (Table 3.1) share similar results regarding gender and age. It was also observed that both groups had moderate to high levels of loneliness, and over half of the participants exhibited low physical activity levels. Moreover, it's possible to ascertain that the group with pulmonary disease generally presents the best mean scores except for BSI-18 somatization. They report lower levels of loneliness and depression and anxiety symptoms, as seen through UCLA-3 and BSI-18, respectively. In terms of support and overall distress, the two groups share comparable results.

Regarding the minimum and maximum values obtained for the numerical variables, the

Table 3.1: Characterization of pulmonary disease (n=67)

	Pulmonary disease	
	Yes	No
	n = 15 (22.400%)	n = 52 (77.600%)
Gender		
Male	6 (40.000%)	18 (34.600%)
Female	9 (60.000%)	34 (65.400%)
IPAQ		
Vigorous	1 (6.700%)	0 (0.000%)
Moderate	4 (26.700%)	19 (36.500%)
Low	10 (66.700%)	33 (63.500%)
Number of Activities		
Zero	3 (20.000%)	1 (1.900%)
One	2 (13.300%)	4 (7.700%)
Two	2 (13.300%)	6 (11.500%)
Three	3 (20.000%)	15 (28.800%)
Four	5 (33.300%)	19 (36.500%)
Five	0 (0.000%)	7 (13.500%)
BI		
Independence	1 (6.700%)	6 (11.500%)
Very low Dependency	2 (13.300%)	4 (7.700%)
Moderate Dependency	4 (26.700%)	17 (32.700%)
Severe Dependency	5 (33.300%)	16 (30.800%)
Total Dependency	3 (20.000%)	9 (17.300%)
Age		
Min	65	65
Max	102	99
$\overline{x}$(s)	82.470 (10.676)	82.080 (9.246)
UCLA-3		
Min	38	34
Max	57	65
$\overline{x}$(s)	50.470 (5.842)	51.100 (5.489)
MSPSS		
Min	45	32
Max	84	84
$\overline{x}$(s)	68.000 (13.277)	67.580 (15.006)
BSI-18 Somatization		
Min	0	0
Max	18	16
$\overline{x}$(s)	7.800 (5.102)	6.670 (4.553)
BSI-18 Depression		
Min	0	0
Max	17	20
$\overline{x}$(s)	7.530 (5.357)	8.650 (5.491)
BSI-18 Anxiety		
Min	0	0
Max	14	17
$\overline{x}$(s)	5.670 (4.012)	6.120 (4.373)
BSI-18 Global Severity Index		
Min	0	5
Max	44	49
$\overline{x}$(s)	21.000 (12.879)	21.440 (11.639)

best and worst scores obtained with the several applied scales were seen in the group with-

out pulmonary disease. As for the participants' functional independence in their daily living activities, both groups showed a more significant percentage of participants in the moderate and severe dependency categories. Furthermore, in Table 3.1, respecting the number of institutional activities the participants participate in, the more prominent category is four activities. While the most popular activity provided by the residential care facilities in the group without pulmonary diseases is sociocultural animation, in the group with pulmonary diseases, it is religious activities (Table 3.2).

Table 3.2: Participation in the institution's activities (n=67)

	Pulmonary disease			
	Present n = 15 (22.40%)		Absent n = 52 (77.60%)	
	Does	Doesn't	Does	Doesn't
Physical Exercise	8 (53.300%)	7 (46.700%)	34 (65.400%)	18 (34.600%)
Sociocultural animation	8 (53.300%)	7 (46.700%)	45 (86.500%)	7 (13.500%)
Religious activities	11 (73.300%)	4 (26.700%)	42 (80.800%)	10 (19.200%)
Psychological support and intervention	1 (6.700%)	14 (93.300%)	20 (38.500%)	32 (61.500%)
Physiotherapy	7 (46.700%)	8 (53.300%)	31 (59.600%)	21 (40.400%)

3.2 Statistical Inference

Proceeding to the findings presented in Table 3.3, Fisher's exact test, at a 5% significance level, indicates no association between the degree of loneliness and the presence of pulmonary disease. Similarly, based on the results shown in Table 3.3, it can be concluded that the existence of pulmonary disease is independent of the gender of the elderly in the RCF ($\chi^2(1)=0.147$, $p=0.702$), their previous area of residence ($\chi^2(1)=0.075$, $p=0.963$), and whether they were institutionalized in an institution in their last area of residence ($\chi^2(1)=0.001$, $p=0.972$). As for the remaining variables, no conclusions can be drawn about their association with the degree of loneliness and the presence of pulmonary disease, as in these cases, the sample fails to meet the necessary conditions for applying the Chi-square test of independence. The same applies to the association with the degree of loneliness.

When we look at the frequency distribution of the severity of loneliness by gender (Table 3.3), we see that most participants, 39 (62.90%), are female and have high levels of loneliness. Furthermore, among women, high loneliness is more prevalent (90.70%), and

Table 3.3: Characterization of loneliness severity and pulmonary disease (n=67)

	Loneliness Severity		**Pulmonary disease**	
	Moderate n = 5 n (% within group) (% within category)	High n = 62 n (% within group) (% within category)	Present n = 15 n (% within group) (% within category)	Absent n = 52 n (% within group) (% within category)
Gender				
Male	1 (20.00) (4.20)	23 (37.10) (95.80)	6 (40.00) (25.00^a)	18 (34.60) (75.00^b)
Female	4 (80.00) (9.30^a)	39 (62.90) (90.70^b)	9 (60.00) (20.90^a)	34 (65.40) (79.10^b)
Civil Status				
Single	1 (20.00) (11.10)	8 (12.90) (88.90)	1 (6.70) (11.10)	8 (15.40) (88.90)
Married	3 (60.00) (21.40^a)	11 (17.70) (78.60^a)	3 (20.00) (21.40^a)	11 (21.20) (78.60^a)
Divorced	1 (20.00) (12.50)	7 (11.30) (87.5)	2 (13.30) (25.00)	6 (11.50) (75.00)
Widowed	0 (0) (0)	36 (58.10) (100.00)	9 (60.00) (25.00^a)	27 (51.90) (75.00^b)
Literacy				
0-4 grade	5 (100.00) (9.10^a)	50 (80.60) (90.90^b)	12 (80.00) (21.80^a)	43 (82.70) (78.20^b)
5-9 grade	0 (0) (0)	4 (6.50) (100.00)	1 (6.70) (25.00)	3 (5.80) (75.00)
10-12 grade	0 (0) (0)	3 (4.80) (100.00)	1 (6.70) (33.30)	2 (3.80) (66.70)
Higher Education	0 (0) (0)	4 (6.50) (100.00)	1 (6.70) (25.00)	3 (5.80) (75.00)
Other	0 (0) (0)	1 (1.60) (100.00)	0 (0) (0)	1 (1.90) (100.00)
Previous Area of Residence				
Predominantly rural	2 (40.00) (13.30)	13 (21.00) (86.70)	3 (20.00) (20.00^a)	12 (23.10) (80.00^b)
Moderately urban	0 (0) (0)	34 (54.80) (100.00)	8 (53.30) (23.50^a)	26 (50.00) (76.50^b)
Predominantly urban	3 (60.00) (16.70^a)	15 (24.20) (83.30^b)	4 (26.70) (22.20^a)	14 (26.90) (77.80^b)
Institution in previous Area of Residence				
No	2 (40.00) (6.50)	29 (46.80) (93.50)	7 (46.70) (22.60^a)	24 (46.20) (77.40^b)
Yes	3 (60.00) (8.30^a)	33 (53.20) (91.70^b)	8 (53.30) (22.20^a)	28 (53.80) (77.80^b)
IPAQ				
Low	4 (80.00) (9.30^a)	39 (62.90) (90.70^b)	10 (66.70) (23.30^a)	33 (63.50) (76.70^b)
Moderate	1 (20.00) (4.30)	22 (35.50) (95.70)	4 (26.70) (17.40^a)	19 (36.50) (82.60^b)
Vigorous	0 (0) (0)	1 (1.60) (100.00)	1 (6.70) (100.00)	0 (0) (0)
Number of activities				
0	0 (0) (0)	4 (6.50) (100.00)	3 (20.00) (75.00)	1 (1.90) (25.00)
1	0 (0) (0)	6 (9.70) (100.00)	2 (13.30) (33.30)	4 (7.70) (66.70)
2	0 (0) (0)	8 (12.90) (100.00)	2 (13.30) (25.00)	6 (11.50) (75.00)
3	1 (20.00) (5.60)	17 (27.40) (94.40)	3 (20.00) (16.70^a)	15 (28.80) (83.30^b)
4	4 (80.00) (16.70^a)	20 (32.30) (83.30^b)	5 (33.30) (20.80^a)	19 (36.50) (79.20^b)
5	0 (0) (0)	7 (11.30) (100.00)	0 (0) (0)	7 (13.50) (100.00)
BI				
Independence	0 (0) (0)	7 (11.30) (100.00)	1 (6.70) (14.30)	6 (11.50) (85.70)
Very low dependency	2 (40.00) (6.70)	28 (45.20) (93.30)	8 (53.30) (26.70^a)	22 (42.30) (73.30^b)
Moderate dependency	1 (20.00) (8.30)	11 (17.70) (91.70)	1 (6.70) (8.30)	11 (21.20) (91.70)
Severe dependency	1 (20.00) (11.10)	8 (12.90) (88.90)	2 (13.30) (22.20)	7 (13.50) (77.80)
Total dependency	1 (20.00) (11.10)	8 (12.90) (88.90)	3 (20.00) (33.30^a)	6 (11.50) (66.70^a)

Prevalence (in %) of the severity of loneliness and pulmonary disease in columns marked with different letters (^{a} and ^{b}) are significantly different ($p<0.05$). The exact Chi-square test was only applied when absolute frequencies were greater than or equal to 3.

the differences observed between moderate and high loneliness are statistically significant ($\chi^2(1)=28.488$, $p<0.001$). It is also women who suffer most from lung disease (9;

60.00%), with lung disease prevalent in 20.90% of cases. In terms of civil status, regardless of the presence of lung disease, it is more common for participants to be widows. Out of the widowed participants, 25.00% had pulmonary disease, with the differences between the two categories being statistically significant ($\chi^2(1)=9.000$, p=0.003). For high levels of loneliness, the majority were widowed. However, for moderate levels of loneliness, it is more prevalent for participants to be married, and the differences in the severity of loneliness were not statistically significant ($\chi^2(1)=4.571$, p=0.033). This is also seen in this category in terms of lung disease ($\chi^2(1)=4.571$, p=0.033). Next, the vast majority have literacy levels between 0-4th grade, and the differences found in terms of both the severity of loneliness ($\chi^2(1)=36.818$, p<0.001). and the presence of lung disease ($\chi^2(1)=17.473$, p<0.001) are statistically significant.

As for the previous area of residence, when comparing the severity of loneliness, we can see that most participants with high levels of loneliness lived in a moderately urban area, 34 (54.80%), while in terms of moderate loneliness, the most common was to live in predominantly urban areas, 3 (60.00%). Nevertheless, the prevalence is higher in high levels of loneliness (83.30%), and these differences are statistically significant ($\chi^2(1)=8.000$, p=0.005). Moving on to lung disease, whether present or absent, it is more common for participants to have lived in moderately urban areas, with 8 (53.30%) and 26 (50.00%), respectively. Furthermore, disregarding the category, the differences found are statistically significant (Predominantly rural $\chi^2(1)=5.400$, p=0.020; Moderately urban $\chi^2(1)=9.529$, p=0.002; Predominantly urban $\chi^2(1)=5.556$, p=0.018).

For both moderate and high levels of loneliness severity and the presence or absence of lung pathology, most participants live in an institution in their previous area of residence, have low levels of physical activity and participate in 4 activities provided by the institution. In addition, statistically significant differences were found in all these categories in all groups. Lastly, when considering the severity of loneliness by BI, it's possible to recognize that the group's largest partition features very low levels of dependency in their daily living activities and have high levels of loneliness, 28 (45.20%). As for the presence of lung disease, it's also more common for the participants to show very low dependency (8, 53.30%), followed by total dependency (3, 20.00%), with the former showing statistically significant differences ($\chi^2(1)=6.533$, p=0.011), while the latter did not ($\chi^2(1)=1.000$, p=0.317).

According to Chan Y H, in the medical research area, a correlation coefficient, in absolute value, less than 0.300 indicates a poor correlation, from 0.300 up to 0.600 a fair correlation, between 0.600 up to 0.800 a moderately strong correlation and a coefficient of at least 0.800 to 1.000 a very strong correlation [67, 68].

With this in mind, we can observe, through Table 3.4, that the Pearson correlation coefficients implied fair significant linear correlations. More specifically, UCLA-3 had a fair positive significant linear correlation with both BSI-18 Somatization and BSI-18 Depression (r=0.316 and r=0.430 respectively). As for MSPSS, we note that it has a fair

Table 3.4: Pearson Correlation Coefficient and Point-Biserial Correlation Coefficient (Loneliness and Disease)

	1	2	3	4	5	6	7	8	9
1. Age	1								
2. UCLA-3	0.010	1							
3. MSPSS	0.006	-0.091	1						
4. BSI-18 Somatization	0.184	0.316*	-0.384*	1					
5. BSI-18 Depression	0.013	0.430*	-0.498*	0.573*	1				
6. BSI-18 Anxiety	0.082	0.201	-0.364*	0.472*	0.482*	1			
7. BI	-0.027	0.076	-0.138	0.089	0.086	0.026	1		
8. Loneliness	0.047	-	0.076	0.130	0.074	0.122	0.095	1	-
9. Disease	0.017	-	0.012	0.101	-0.086	-0.044	0.131	-	1

* denotes significant population correlations, at a 5% level of significance.

negative significant linear correlation with BSI-18 Somatization, BSI-18 Depression and BSI-18 Anxiety (r=-0.384, r=-0.498 and r=-0.364). In addition, it has also been shown that among all BSI-18 there is a fair positive significant linear correlation. Now, for the point-biserial correlation coefficients with loneliness (Table 3.4) we can see that none of the correlations are statistically significant. The same can be said for the point-biserial correlation coefficients with disease.

Last but not least, Table 3.5 shows the means and medians of Age, MSPSS, BSI-18 Somatization, BSI-18 Depression, BSI-18 Anxiety and BI according to the severity of loneliness and the presence or absence of lung disease. Starting with age, in terms of means, we found that the results are roughly the same, which is also true for medians, except for a moderate severity of loneliness, which is slightly lower. Regarding MSPSS, while there are no considerable differences in the means or medians, regardless of the presence or absence of lung disease, the same is not valid for the severity of loneliness. Participants with moderate loneliness showed lower mean levels of support when compared to their colleagues with high levels. The same applies to the medians as well.

Moving on to the BSI, we see that for somatization symptoms as well as depression and anxiety symptoms, high levels of loneliness are associated with higher averages, i.e. more symptoms, than moderate levels. Concerning lung disease, while the average is higher in participants with this pathology for somatization symptoms, the opposite is true for anxiety and depression symptoms. The results obtained in the medians were compatible with those obtained in the averages, except for BSI-18 Anxiety, whose median results were higher when the participants had lung disease. When comparing the means and medians in the BI, it is possible to see that participants with lung disease or high loneliness have higher values, i.e. lower dependence on their activities of daily living, than participants without this disease or with moderate loneliness. As for the minimum values, they are all practically the same. The maximum values show some discrepancies, especially in the

Table 3.5: Characterization of the severity of loneliness and pulmonary disease considering age and the scores obtained with the various scales applied.

	$\overline{x}$(s)	Med (IQR)	Max	Min
Age				
Moderate Loneliness n = 5	80.60 (10.065)	83.00^a (18)	90	65
High Loneliness n = 62	82.29 (9.529)	84.00^a (16)	102	65
Pulmonary Disease Present n= 15	82.47 (10.676)	84.00^a (13)	102	65
Pulmonary Disease Absent n= 52	82.08 (9.246)	83.50^a (16)	99	65
Total n = 67	82.16 (9.501)	84.00 (15)	102	65
MSPSS				
Moderate Loneliness n = 5	63.80 (15.156)	61.00^a (29)	82	45
High Loneliness n = 62	67.98 (14.573)	71.50^a (24)	84	32
Pulmonary Disease Present n= 15	68.00 (13.277)	71.00^a (25)	84	45
Pulmonary Disease Absent n= 52	67.58 (15.006)	71.50^a (24)	84	32
Total n = 67	67.67 (14.541)	71.00 (25)	84	32
BSI-18 Somatization				
Moderate Loneliness n = 5	4.80 (4.604)	4.00^a (8)	12	0
High Loneliness n = 62	7.10 (4.665)	6.00^a (6)	18	0
Pulmonary Disease Present n= 15	7.80 (5.102)	8.00^a (8)	18	0
Pulmonary Disease Absent n= 52	6.67 (4.553)	5.50^a (6)	16	0
Total n = 67	6.93 (4.666)	6.00 (6)	18	0
BSI-18 Depression				
Moderate Loneliness n = 5	7.00 (4.183)	6.00^a (7)	14	3
High Loneliness n = 62	8.52 (5.542)	8.00^a (8)	20	0
Pulmonary Disease Present n= 15	7.53 (5.3579)	6.00^a (7)	17	0
Pulmonary Disease Absent n= 52	8.65 (5.491)	8.00^a (8)	20	0
Total n = 67	8.40 (5.441)	7.00 (8)	20	0
BSI-18 Anxiety				
Moderate Loneliness n = 5	4.20 (2.490)	5.00^a (4)	6	0
High Loneliness n = 62	6.16 (4.362)	5.00^a (7)	17	0
Pulmonary Disease Present n= 15	5.67 (4.012)	6.00^a (8)	14	0
Pulmonary Disease Absent n= 52	6.12 (4.373)	5.00^a (7)	17	0
Total n = 67	6.01 (4.269)	5.00 (7)	17	0
BI				
Moderate Loneliness n = 5	49.00 (40.682)	45.00^a (80)	100	10
High Loneliness n = 62	59.76 (29.231)	65.00^a (50)	100	5
Pulmonary Disease Present n= 15	66.33 (33.084)	80.00^a (50)	100	5
Pulmonary Disease Absent n= 52	56.83 (29.004)	60.00^a (45)	100	5
Total n = 67	58.96 (29.969)	65.00 (50)	100	5

Medians marked with different superscript letters (^{a} and ^{b}) are significantly different ($p<0.05$) (Mann-Whitney test)

BSI-18 Somatization, Depression and Anxiety, corroborating the results obtained in each of the averages and medians. Finally, through the Mann-Whitney test, we found that none of the differences observed in the medians were significant at the 5% significance level ($p<0.05$).

Discussion

As mentioned, this study aimed to analyze loneliness in older adults and its relationship with respiratory diseases, as well as with other variables. However, no associations were found. Nevertheless, the results showed alarming levels of loneliness in the participants, with the severity ranging from moderate to mainly high levels. Despite the presence of pulmonary pathology being independent of gender, the previous area of residence, and institutionalization status in the prior location of residence, certain quantitative variables were significantly linearly correlated. The UCLA-3 with both the BSI-18 Somatization and Depression and the BSI-18 between them were positive, and the MSPSS with all the BSI-18 was negative.

Before interpreting these results, a few factors need to be considered. The size of this sample is by far a small sample. In addition, this study deals with a particular population, elderlies in RCF, and the literature linking loneliness and health in these adults is limited, as stated by Gardiner *et al.* [9]. As for studies linking loneliness and the presence of lung diseases in this specific population, none were found.

Although the results obtained were not what was expected and do not match the findings of most of the literature, the results seem to be in line with those obtained by Christiansen *et al.* in the sense that there is no association between loneliness and the presence of lung disease, but that the former is a modifiable risk factor that can contribute to the worsening of the latter [25].

As previously mentioned, the levels of loneliness found were concerning, with an estimate of 92.5% for high level loneliness. With loneliness being *"a multidimensional and complex construct"* [66], some related factors can be found throughout the study. Civil status and social environment were some of those factors. In this study, we found that more than half of the participants were widowed and that every single one of them had high levels of loneliness. This is in line with the literature, with numerous studies showing that being married is a protective factor and that losing a spouse is associated with increased loneliness [3, 20, 36, 37]. The same thing was said by Ahmed Abu hashem Mohammed *et al.* for the loss of friends, family and other close people, all of whom are related to feelings of grief and emotional distress and, consequently, loneliness [36]. These social factors are even more critical in older adults [2, 3, 36, 37]. In addition to the abovementioned situations, some elderly people find themselves alone, without family members to care for them [36, 37]. Due to physical limitations acquired naturally by age or individual pathologies, others cannot achieve satisfactory social involvement, leading to feelings of loneliness [37, 39]. In the case of RCF, many users find themselves in the situations mentioned above [36].

Regarding RCF, Gardiner *et al.*, through a systematic review and meta-analysis, found information suggesting that older adults living in these infrastructures have a prevalence

of loneliness equal to, if not higher than, elderly people living in the community [9]. In addition, studies found by these authors that directly compared the levels of loneliness between older people living in RCF and their own homes showed that the former had significantly greater levels [9]. Although this information may seem counterproductive, given that in RCF, users are surrounded by other users, staff and visitors, both Gardiner *et al.* and Ahmed Abu hashem Mohammed *et al.* found that the relationships formed in most cases are superficial rather than deep or genuine, leading to a sense of detachment and an incremented of the feelings of loneliness [9, 36]. Likewise, most users have very different cognitive abilities, making socialization even more complex [9, 36].

Both Gardiner *et al.* and Ahmed Abu hashem Mohammed *et al.* also highlighted how a loss in autonomy in terms of losing the possibility of controlling their own lives and making decisions, as well as a lack of work goals or doing exercises without a clear objective, can lead to boredom and lack of social involvement, thus contributing to worsening loneliness [9, 36]. It is essential to note that despite studies suggesting that the above factors influence the results obtained, these were not addressed in this study.

It is essential to consider that the population in this study had other pathologies, both physical and psychological, in addition to respiratory ones. Although these were not addressed in this study, this does not mean that they cannot influence loneliness since, as mentioned in the introduction, the latter is related to the former [3, 23, 40]. Loneliness is shown to predict physical health, with an increase in chronic illness, functional limitations, impaired mobility, and psychological symptomatology, such as depression, anxiety, cognitive performance, and diminished HQoL [3, 20, 22, 69]. It was also proposed by Hyland *et al.* that it *"might be a manifestation of depressive symptoms and low quality of life"* [49].

Some studies also showed that the female gender [3, 20, 38] and lower literacy levels [20, 37, 69] are linked to loneliness, something that this study was unable to demonstrate since gender proved to be independent of both loneliness and the existence of lung pathology and literacy did not fulfil the necessary conditions for the chi-square test to be applied. In addition, the previous area of residence was independent of the degree of loneliness and pulmonary disease. This is neither against nor in line with the literature since no consensus exists [40]. Overall, these results are more likely due to the sample size.

Another factor we should bear in mind is that, even though a few years have passed since the start of the COVID-19 pandemic, its effects are still being felt today, particularly among those living in care facilities where visiting policies have been restricted. Prior to the pandemic, these policies didn't exist. Although vaccinations have provided some relief in certain facilities, many are still enforcing limitations on the frequency, duration, number of visitors, and physical contact during visits. This can lead to ongoing feelings of isolation and loneliness among residents [16]. As previously mentioned, some quantitative variables had a reasonably significant linear correlation. The UCLA-3, which measures loneliness, was positively correlated with the BSI-18 Somatization and Depression, which

aligns with what was said earlier about loneliness and its association with psychological symptoms [3, 20].

The MSPSS, a scale that measures social support perceived by the individual, was inversely related to all the parameters assessed by the BSI-18, showing a reasonable negative linear correlation. In other words, a greater understanding of support from family, friends and significant others is linked to fewer symptoms of depression, somatization, and anxiety, which is in line with the literature [41–44]. Finally, it was found that all the BSI-18 parameters, which refer to the psychopathological symptoms of somatization, depression and anxiety, were mutually positively correlated, something that was to be expected since they belong to the same scale. It should also be noted that there is an overlap of symptoms associated with each parameter and that these pathologies can be comorbid [45, 46].

It was found that participants with moderate levels of loneliness had lower values of social support when compared to participants with high levels of loneliness. This goes against what is seen in the literature, which links loneliness to a deficit in social support in older people in RCF. In other words, people with greater social support have less loneliness and vice versa [47]. This result illustrates the complexity of loneliness, which may not be related to the social support the person perceives. Loneliness is more than the existence and perception of support. It is more related to a mismatch between what the person wishes to have and perceives they have. However, once again, the size of the sample and the fact that this difference was not significant must be considered, so this result should not be generalized.

This study has raised the importance of recognizing loneliness as a modifiable risk factor that can have several harmful effects on health, particularly among senior citizens living in RCF. However, these effects and their relationship with loneliness still need to be better studied, highlighting the need for further research. In addition, it is necessary to promote measures to reduce loneliness in RCF. Some of the interventions suggested are providing psychological support to all users and promoting activities and involving the elderly in them to keep them occupied. It is also suggested to promote interaction with families and friends, even with the use of technology, such as videoconferencing, and removing the visiting restrictions that are still in place in many RCF since they were implemented during the pandemic [3, 8, 38]. The aim is, therefore, to reduce loneliness and thus make RCF healthier places with a better quality of life. However, once again, further research is needed as the current findings are contradictory, and there is little evidence of its effectiveness.

The potential of this study lies in the fact that it focused on the elderly population living in RCF, an undervalued population, and in the fact that questionnaires were applied to them. The results highlighted the critical problem of loneliness and the need to take measures to reduce it. Furthermore, it emphasized the possibility of conducting a longitudinal study and obtaining relevant data for other studies in RCF in different areas of the country with more variables and a larger sample.

As for the limitations, a few aspects of this study must be considered. There is the fact that the sample was a convenience sample and small in size. There were also some difficulties in administering the questionnaires since this population was older. Moreover, the severity of the pathologies was not assessed. There is also a need for more extensive studies looking at other variables, including clinical ones.

Conclusion

To sum up, this study addressed the importance of analyzing loneliness and its relationship with health and quality of life in the elderly living in RCF, in Leiria, with lung diseases. Although no association was found between loneliness and respiratory pathologies in this population, this study observed worrying levels of loneliness. These levels must be urgently addressed since, as mentioned in this paper, loneliness seriously damages individuals' health and quality of life. This is especially important in the population under study, which is at greater risk of developing loneliness due to the natural processes of aging and the situations that inevitably happen in life.

Additionally, this study also highlights the importance of addressing respiratory diseases. With incidence levels increasing annually and a high burden of disease, it is also urgent to address this group of pathologies, mainly as most are preventable or treatable. This only further highlights the need for comprehensive and well-coordinated interdisciplinary care and specialized training and expertise in geriatrics. Moreover, this study also aims to open doors for other studies, especially those dedicated to such particular populations, because there is a lack of knowledge in this area. We should all ensure the best possible care and quality of life, especially in old age, because inevitably, we are all naturally moving in this direction, and we all want to live, not just survive.

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