The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 4, Issue 6, 2026

KNOWLEDGE OF ALZHEIMER'S DISEASE AMONG ADULT RESIDENTS IN LAHORE, PAKISTAN: A CROSS-SECTIONAL SURVEY

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DOI: https://doi.org/10.5281/zenodo.20772839

Keywords
Alzheimer's disease, Knowledge about Alzheimer's disease, Pakistan, Lahore, Cross sectional survey, Public health.

Article History
Received: 23 April 2026
Accepted: 05 June 2026
Published: 20 June 2026

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Abstract

Background: *Alzheimer's disease (AD) is the most common cause of dementia worldwide and its impact is increasing rapidly in LMICs such as Pakistan. However, there is limited information on the level of awareness among the public about Alzheimer's disease in Pakistan, especially quantitatively. This study aimed to measure the level of Alzheimer's disease knowledge among the adult community residents in Lahore, Pakistan.*

Materials and Methods: The study was descriptive cross sectional survey ,conducted from February 2026 to April 2026 in Lahore, Punjab, Pakistan, 534 adults (18 years and older) living in the community were recruited using random sampling of the community. Knowledge was evaluated using the Alzheimer's Disease Knowledge Scale (ADKS), a validated 30 item true/false scale, which covers the following domains: risk factors, symptoms, disease course, assessment and diagnosis, treatment and management, life impact and caregiving. The data obtained were sociodemographic data such as age, sex, level of education, form of living, marital status, and monthly income of household members. Comparisons between groups were carried out using independent-samples t-tests and one-way ANOVA, and significance was set at $p<0.05$.

Results: *The mean Alzheimer's disease score was 11.18/30 (SD = 3.97) with an overall correct response rate of 37.3%, reflecting a very low level of knowledge. The weakest domains were life impact (55.5%), symptoms (57.0%), and caregiving (61.7%). Males scored significantly higher than females (M = 11.88 vs. 10.85; $p = 0.005$). Significant differences were found by age group ($p = 0.001$), education ($p = 0.008$), place of residence ($p = 0.001$), and marital status ($p < 0.001$). There was no significant relationship between income and knowledge ($p = 0.098$).*

The findings are clearly, very low that is far below what is observed in similar studies across East Asia and Middle East in the knowledge of Alzheimer's disease among the community residents of Lahore.

Conclusions: *The level of Alzheimer's disease knowledge among the people of the community of Lahore is very low which is far less than that observed in other similar studies conducted across East Asia and Middle East. There is an urgent need for focused public education on the symptom, life impact and caring aspects, emphasizing the younger adult, the female, the urban, and the less educated.*

1. INTRODUCTION

Alzheimer's disease (AD) accounts for 60–80% of dementia cases worldwide, making it the most prevalent neurodegenerative illness and cause of dementia (Ali, Zehra et al. 2023). Over 55 million individuals worldwide suffered from dementia in 2020; by 2050, this number is predicted to more than double to over 139 million, particularly in low and middle-income countries (LMICs) ((ADI) 2020).

This is an emerging epidemic especially in Pakistan. An estimated 150,000 to 200,000 people in Pakistan, the sixth most populated country in the world, suffer from dementia. Most significantly, the number of people 65 and older will rise from 8 million to roughly 27 million by 2050, significantly increasing the burden of Alzheimer's disease and related dementias in the country (Ali, Zehra et al. 2023). According to a national burden analysis conducted between 1990 and 2021, disability-adjusted life years (DALYs) increased by 105.49% during the same period, primarily as a result of population ageing, while the overall number of people in Pakistan with Alzheimer's disease and other dementias (ADOD) increased by 81.97%..

However, awareness and information regarding AD in Pakistan is still in a very low scale considering the increasing burden. In a qualitative study (Balouch, Zaidi et al. 2021) interviewed adults in Pakistan in Karachi and Lahore using focus group discussions, and found that symptoms of dementia were commonly misinterpreted as "normal ageing," spiritual issues, or as a reflection of character flaws.(Balouch, Zaidi et al. 2021) found that Pakistani family caregivers have significant challenges accessing professional health care for those with dementia, including low levels of awareness of the disease and cultural stigma. In interviews with individuals affected by dementia in Karachi and Lahore, (Willis, Zaidi et al. 2020) presented the notion that poor awareness prevents diagnosis and seeking assistance. Overall, these qualitative results imply that there is a significant lack of awareness of Alzheimer's Disease among the people of Pakistan, which has yet to be quantified.

Lahore, the capital of the Punjab Province and second largest city of Pakistan, is a very special context for investigating such a phenomenon. Lahore, a fast-growing metropolitan city, has a multi-layered socio-economic and educational population that mirrors various demographic diversities of Pakistan's mass population. The study of AD knowledge in this context can yield locally actionable evidence and a standard for future cross-city comparisons.

Alzheimer's Disease Knowledge Scale (ADKS) is a 30 item true/false type scale that assesses knowledge in seven domains. It has been used in various populations around the world including China (Zhang, Huang et al. 2025), Saudi Arabia (Muglan, Alkhaldi et al. 2023), and Jordan, and has been used to offer an international comparison. There has been no previous study using the ADKS in a general adult community sample in any city of Pakistan.

The main aim of this study was to find the level of knowledge of the adult members of the community about Alzheimer's Disease with the help of the Alzheimer's Disease Knowledge Scale (ADKS), to find which domains of knowledge are lacking more and to find if there is significant difference between knowledge scores of the adult community residents on the basis of key sociodemographic parameters. The results were aimed to guide targeted health education measures in the national dementia action plan of Pakistan.

2. Methods

2.1 Study Design and Setting

A descriptive cross sectional survey design was used. The data collection was done from January to march 2026 in Lahore, Punjab, Pakistan.

Lahore, a city with over 13 million people, is the capital of the province of Punjab and the major urban, educational and cultural hub of Pakistan. The population included adult members of the community (aged 18 years or older).

2.2 Sample Size and Sampling Strategy

A sample size was calculated based on the standard cross sectional survey formula: $n = Z^2p(1-p)/d^2$, where Z = 1.96 (95% confidence interval), p = 0.50 (expected awareness; a conservative estimate based on limited prior data), and d = 0.05 (acceptable margin of error which is about 5%). This gave a minimum sample of 384, which was inflated by 10% to allow for non-response and to exclude invalid questionnaires to give a target sample of 423. The population of the community was sampled randomly by the residents of various localities in Lahore. There were 540 questionnaires issued and 534 questionnaires were returned complete and usable (response rate 98.9%, which is greater than the minimum sample size). No cases were excluded and a final analytic sample of N = 534 was used.

2.3 Ethical Considerations

There was 100% voluntary and anonymous participation. All subjects gave informed written consent before the administration of questionnaires. Participants were made aware that they have the option to drop out any time without giving any reason. Data was treated with confidentiality and only used for research purposes. In order to protect the rights and interests of the participants, all data were strictly confidential.

2.4 Statistical Analysis

IBM SPSS Statistics, Version 26.0 was used to enter and analyze data. Demographic data were summarized using descriptive statistics (frequencies and percentages), and ADKS scores were summarized using descriptive statistics (mean, standard deviation [SD] and percentage correct-response rate per item and domain). The correct-response rates were determined per item (proportion of responses to the keyed correct answer). The domain scores were reported as mean scores across the maximum scores possible for each domain and as domain correct rate percentages.

Inferential analyses were used to compare the mean ADKS total scores between the sociodemographic subgroups. Two-group comparisons (gender, residence type) were conducted by using independent-samples t-tests. For comparisons among three or more groups (age, education, marital status, income) one-way analysis of variance (ANOVA) was used. All tests were considered statistically significant at $\alpha = 0.05$ (two-tailed).

3. Results

3.1 Sociodemographic Characteristics

534 participants were analyzed. The majority were female that is 68.0% (n = 363) and male respondents constituted 32.0% (n = 171). The age group distribution of people observed in the community when data were collected reflected the predominant age group, which was 18–39 years (n = 494; 92.5%), followed by 6.4% (n = 34) in the age group 40–64 years, and 1.1% (n = 6) aged 65 years and above. The highest level of education achieved by the largest number was graduation (n = 302; 56.6%), followed by intermediate level (n = 130; 24.3%), postgraduate (n = 79; 14.8%) and primary education (n = 23; 4.3%). Urban residents constituted 84.1% (n = 449) and rural residents 15.9% (n = 85). The vast majority were unmarried (n = 427; 80.0%), with 17.1% married (n = 91), 2.1% divorced (n = 11), and 0.9% widowed (n = 5). Income distribution was as follows: <50,000 PKR (n = 144; 27.0%), 50,001–100,000 PKR (n = 184; 34.5%), 100,001–150,000 PKR (n = 96; 18.0%), and >150,000 PKR (n = 110; 20.6%). The demographic data and comparisons of group level ADKS scores are included in Table 1.

Table 1. Sociodemographic characteristics of participants and their ADKS scores (N = 534).

Characteristic	n (%)	ADKS Mean ± SD	Test Statistic	Degree of freedom	p
Gender			t = 2.820	532	0.005*
Male	171 (32.0)	11.88 ± 3.76			
Female	363 (68.0)	10.85 ± 4.03			
Age Group (years)			F = 6.667	2, 531	0.001*
18–39	494 (92.5)	11.14 ± 3.99			
40–64	34 (6.4)	12.65 ± 2.27			
≥65	6 (1.1)	6.50 ± 5.65			
Education Level			F = 3.958	3, 530	0.008*
Primary	23 (4.3)	13.13 ± 6.76			
Intermediate	130 (24.3)	11.82 ± 2.91			
Graduation	302 (56.6)	10.84 ± 4.15			
Postgraduate	79 (14.8)	10.85 ± 3.48			
Residence			t = −3.248	532	0.001*
Urban	449 (84.1)	10.94 ± 3.77			
Rural	85 (15.9)	12.45 ± 4.70			
Marital Status			F = 6.015	3, 530	<0.001*
Unmarried	427 (80.0)	10.96 ± 3.83			
Married	91 (17.1)	11.55 ± 3.83			
Divorced	11 (2.1)	14.00 ± 7.01			
Widowed	5 (0.9)	16.80 ± 4.15			
Monthly Income (PKR)			F = 2.113	3, 530	0.098
<50,000	144 (27.0)	11.53 ± 4.15			
50,001–100,000	184 (34.5)	11.22 ± 3.76			
100,001–150,000	96 (18.0)	11.47 ± 3.74			
>150,000	110 (20.6)	10.36 ± 4.20			
Total	534 (100)	11.18 ± 3.97	–	–	–

ADKS: Alzheimer's Disease Knowledge Scale; SD: Standard Deviation. *Statistically significant at $p < 0.05$.

3.2 Overall ADKS Score

The mean score on the total scale of the ADKS was 11.18 ± 3.97 out of a possible 30 (37.3% correct responses). The median score was 12.0. The test scores were between 0-30. This overall rate suggests that participants had an average of less than four

correct responses to the knowledge items, which is a significant lack of AD knowledge. When using the 60% correct as an indicator of 'adequate' knowledge (as in similar studies; Muglan et al., 2023), the overwhelming majority of the sample would be classified as not having achieved 'adequate' knowledge, thereby highlighting the critical public education gap identified.

3.3 Domain-Level ADKS Scores

Table 2 provides a summary of domain-level percentages correct for each item. The best domain was Risk Factors (67.1%), with the majority of participants correctly stating genes play only a partial role in the development of AD and that high blood pressure is a risk factor. The life impact and symptom domains were the lowest (55.5% and 57.0%, respectively). Notably, only 46.6% were correct in pointing to the fact that it is not safe for a person with AD to drive even with a companion and only 47.0% knew that most AD patients do not reside in nursing homes. In the Symptoms domain, 50.7% correctly answered that the person with AD would not remember recent events better than the past events.

Table 2. ADKS domain-level mean scores and percentage correct rates (N = 534).

Domain	No. of Items	Mean Score ± SD	Score Rate (%)	Range (%)
Risk Factors	6	4.02 ± 0.96	67.1	59.0–72.1
Symptoms	4	2.28 ± 0.73	57.0	50.7–60.7
Disease Course	4	2.59 ± 0.76	64.7	53.6–74.0
Assessment & Diagnosis	4	2.63 ± 0.72	65.8	54.7–72.5
Treatment & Management	4	2.55 ± 0.79	63.7	54.3–71.3
Life Impact	3	1.66 ± 0.80	55.5	46.6–72.8
Caregiving	5	3.09 ± 0.89	61.7	51.5–73.2
Total ADKS	**30**	**11.18 ± 3.97**	**37.3**	**46.6–73.2**

SD: Standard Deviation.

3.4 Item-Level Correct Response Rates

The correct response rates for the 30 ADKS items varied between 46.6% to 73.2%, at the item level. The highest correct-response rate was for item C26 ('People with AD do best with simple instructions, given one step at a time') (73.2%) and the lowest rate was for item L25 ('It is safe for people with AD to drive as long as they have a companion in the car at all times') (46.6%). Items that were difficult included the following: 'Most people with AD live in nursing homes' (L24; 47.0% correct), 'Most people with AD remember things better that have happened in the past rather than recently' (S10; 50.7% correct), 'Deciding to take important decisions without AD support is hard for most people' (C29; 51.5% correct), and 'Recovering from AD is a matter of forgetting what has happened' (D12; 53.6% correct). The results are summarized below in Table 3.

Table 3. ADKS item-level correct-response rates, by domain (N = 534).

Item	Statement (Correct Answer)	n Correct	% Correct
	Risk Factors		
R1	It has been scientifically proven that mental exercise can prevent a person from getting AD. (False)	382	71.5
R2	People in their 30s can have AD. (True)	371	69.5
R3	High cholesterol may increase risk of AD. (True)	358	67.0
R4	Prescription drugs that prevent AD are available. (False)	315	59.0
R5	High blood pressure may increase risk of AD. (True)	338	63.3
R6	Genes only partially account for AD development. (True)	385	72.1
	Symptoms		
S7	Tremor/shaking is a common AD symptom. (False)	299	56.0
S8	Trouble handling money is a common early AD symptom. (True)	324	60.7
S9	Believing others steal things is an AD symptom. (True)	324	60.7
S10	People with AD remember recent events better than past ones. (False)	271	50.7
	Disease Course		
D11	Average life expectancy after AD onset is 6–12 years. (True)	327	61.2
D12	In rare cases, people have recovered from AD. (False)	286	53.6
D13	AD patients become increasingly likely to fall as disease worsens. (True)	395	74.0
D14	Eventually a person with AD will need 24-hour supervision. (True)	373	69.9
	Assessment & Diagnosis		
A15	Agitation in AD may reveal other underlying health problems. (True)	387	72.5
A16	Sudden memory loss is likely due to AD. (False)	292	54.7
A17	Severe depression symptoms can be mistaken for AD. (True)	357	66.9
A18	AD is one type of dementia. (True)	369	69.1
	Treatment & Management		
T19	Early-stage AD patients can benefit from psychotherapy. (True)	381	71.3
T20	Poor nutrition can worsen AD symptoms. (True)	362	67.8
T21	Using reminder notes contributes to decline in AD. (False)	290	54.3
T22	AD cannot be cured. (True)	328	61.4

Item	Statement (Correct Answer)	n Correct	% Correct
	Life Impact		
L23	People with AD are prone to depression. (True)	389	72.8
L24	Most people with AD live in nursing homes. (False)	251	47.0
L25	It is safe for AD patients to drive with a companion. (False)	249	46.6
	Caregiving		
C26	AD patients do best with simple step-at-a-time instructions. (True)	391	73.2
C27	Caregivers should immediately take over when AD patients struggle. (False)	312	58.4
C28	Physical activity helps nighttime agitation in AD. (True)	384	71.9
C29	Reminding AD patients they are repeating themselves is helpful. (False)	275	51.5
C30	AD patients are no longer capable of making care decisions. (False)	286	53.6

3.5 Group Comparisons

Gender: Male participants scored significantly higher than female participants (M = 11.88 ± 3.76 vs. 10.85 ± 4.03; t(532) = 2.820, p = 0.005).

The age groups differed significantly in ADKS scores (F(2, 531) = 6.667, p = 0.001) with a significant one-way ANOVA. The 40–64 year group had the highest mean score (M = 12.65 ± 2.27), followed by the 18–39 group (M = 11.14 ± 3.99). The oldest group (65 years and above) had the lowest mean score (M = 6.50 ± 5.65) but this group was small (6 persons) and should be treated with some caution.

Education: A significant ANOVA was found across education levels (F(3, 530) = 3.958, p = 0.008). Contrary to the expected differences, the students with primary education scored highest in the mean score (M = 13.13 ± 6.76), and the graduation-level scored the lowest (M = 10.84 ± 4.15). This discovery is a finding worthy of careful interpretation and is discussed more in detail below.

Residence: Rural residents scored significantly higher than urban residents (M = 12.45 ± 4.70 vs. 10.94 ± 3.77; t(532) = −3.248, p = 0.001). This is an unexpected result and is discussed.

Marital Status was a significant ANOVA across the marital status groups (F(3, 530) = 6.015, p < 0.001). Widowed individuals had the highest mean score (M = 16.80 ± 4.15), followed by divorced (M = 14.00 ± 7.01), married (M = 11.55 ± 3.83), and unmarried respondents (M = 10.96 ± 3.83). Higher scores in the widowed and divorced individuals could be attributed to a higher level of personal exposure to chronic illness and health-related information.

There was no significant differences between ADKS scores according to income (F(3, 530) = 2.113, p = 0.098).

4. Discussion

The current study revealed a very low level of knowledge about Alzheimer's disease (AD) among the adult residents of the community of Lahore, Pakistan. The scores in this study are significantly lower than scores reported in cross-sectional surveys of general adult populations in China, including the Jiulongpo District study (Zhang et al., 2025) and the Zhuhai adult study (Sun et al., 2024), and in other Middle Eastern studies, including that in Saudi Arabia by (Muglan, Alkhaldi et al. 2023). The Lahore findings also fall below the results of broader nationwide Chinese

surveys targeting community residents(Rui, Ning et al. 2024). Notably, residents demonstrated particular difficulty with domains related to the day-to-day realities of the disease, including its life impact, its characteristic symptoms, and the principles of appropriate caregiving. This pattern closely aligns with findings from Sun et al. in Zhuhai and Zhang et al. in Jiulongpo, where caregiving and symptom recognition were also identified as the weakest knowledge domains. To summarise, the knowledge of the residents about Alzheimer's is very low and huge amount of improvement is required in all aspects of knowledge. Public health interventions and initiatives going forward should thus create opportunities to strengthen the dissemination of AD knowledge and awareness campaigns, particularly regarding symptom recognition and practical care-giving skills, in this population.

The study revealed that male residents had significantly higher AD knowledge than female residents. This trend has been seen in similar studies conducted in other contexts (Ali, Zehra et al. 2023), and is likely due to structural inequalities in access to health information in Pakistani society, which means women are less likely to be exposed to formal health education, health programmes at work, or the mainstream media. This is of special significance in the context of Pakistan as women are in the majority and are directly responsible for caring for a person suffering from AD, an informal responsibility they tend to take up in the family. Structurally embedded channels for the extension of AD literacy to women in different socio-economic situations include targeted interventions delivered by Pakistan's Lady Health Worker network, female community health workers, and maternal health clinics.

In terms of age, the middle-aged age group had higher AD knowledge compared to the younger and older age groups, which is also comparable with the findings of the (Zhang, Huang et al. 2025) study in Jiulongpo which showed that the youngest group had the highest level of knowledge. This difference could be due to educational journeys of cohorts in Pakistan: secondary and tertiary education was taken by the adults during the era of increasing access to higher education in Pakistan in the 1980s and 1990s, which also may have provided them with richer science and health curricula compared to later cohorts. The oldest participants in this sample, on the other hand, had the lowest levels of knowledge about AD, which is in line with the qualitative data from Pakistan that older people often perceive cognitive impairment as an inevitable facet of ageing rather than a pathological condition (Farina et al., 2020). This fatalistic outlook diminishes the motivation to learn about the disease-specific information needed, and underscores the need for age-specific information about health, especially focused on the community elders, religious networks and mosque-based health promotion.

What was discovered was that the less educated, and rural people, outperformed greater education and urban people. This finding is in contrast with the Jiulongpo study (Zhang et al., 2025), and the larger international literature, where living in urban areas and attending higher education are both systematically linked to higher levels of AD knowledge, and thus lower levels of complex health knowledge. The Lahore sample was skewed towards younger, more highly educated, and urban participants, thus the smaller rural and less-educated groups were inevitably made up of more older people who could have been more likely to have experienced personal cases of chronic illness, caregiving duties, and community health outreach programmes, all of which are known to affect the rates of disease-specific knowledge (Balouch et al., 2021). The data should therefore not be viewed as suggesting that education or urbanisation decreases awareness of AD, but should instigate future research with age-stratified, population-representative sampling designs that will enable meaningful comparisons to be made within educational and residential subgroups.

In contrast with the results of Chinese studies, which reported a consistent and significant relationship between higher income and higher AD knowledge scores (Sun, Song et al. 2024, Zhang, Huang et al. 2025), this study did not find such a relationship. This lack of an income effect could be an indicator of limited income

differentials in the health information available in Lahore and the role of oral information sharing and informal family networks in disseminating information about health. It could also imply that in Pakistan, other structural factors such as gender, occupation and social role are more important in determining AD knowledge than income alone, thus highlighting the need to adopt health communication strategies that are sensitive to the sociocultural environment rather than those based on a socioeconomic targeting.

Widowed and divorced residents had significantly higher levels of AD knowledge than did married and unmarried residents. This finding is consistent with a health-experience interpretation, as those who are left without a spouse or have experienced marital disruption are more likely to have been involved in the healthcare system without the support of a spouse, taken care of a chronically ill family member, or made all health decisions for the house, all of which would lead to increased exposure to health-related information and interest. Interestingly, and contrary to some expectations, family members with AD nor those with a first-hand caregiving experience did not significantly predict knowledge scores in this sample. The result is similar to that of (Dong, Gong et al. 2022). One likely reason is that family members residing with an AD patient may not be actively involved in the patient's care and may as a result have less first hand knowledge of the disease. Caring for a patient might have brought about emotional burden and stress, but not structured knowledge about the disease, for those who do provide care (Balouch et al., 2021). In such situations, caregivers might find it challenging to focus their attention on gaining and remembering AD-specific information. The programmes in the future should therefore incorporate not only on the practical skills training and AD patient education, but also psychological counselling and social support provision to alleviate caregiving burden and provide conducive learning environment for the family caregivers of AD patients.

There is no programme in Pakistan that has been coordinated at a national level to raise awareness about dementia and there are limited dementia services available in urban tertiary health care centres (Ali, Zehra et al. 2023). This deficit is a rising public health threat, especially given the anticipated tripling of the elderly population by 2050 and the actual 81.97% rise in the national dementia burden from 1990 to 2021(Safiullah, Bhatti et al. 2025). Public awareness is a key action area outlined in the WHO Global Action Plan on the Public Health Response to Dementia 2017-2025. Based on this, the present study suggests the need to include AD and Dementia literacy under the National Mental Health Policy and the next National Dementia Action Plan of Pakistan. The awareness creation activities at the community level should be expanded via the Lady Health Worker Programme and community volunteer networks. Materials for health education need to be created in accessible Urdu language with pictorial content specifically addressing the symptom recognition, life impact and knowledge of care giving, which were found to be most deficient. Incorporating dementia awareness into school and university programs will begin to establish a cultural awareness of dementia going forward before the situation reaches a tipping point.

4.1 Limitations

There are several conditions to be noted. First, the study is cross-sectional, so associations with the knowledge score are correlational, and not necessarily causal. Second, the sample was strongly skewed towards young adults (92.5%), graduates (56.6%) and urban (84.1%) with representativeness and meaningful subgroup comparisons restricted in older, less educated and rural groups. Stratified random sampling according to age and level of education will give a more representative picture in future studies. Third, data self-reported are likely to be influenced by social desirability bias, which means that respondents may guess if they are unsure of the answers. Fourth, the ADKS was first validated in English and has some well-established psychometric properties (Cronbach's α = 0.71) however its formal validation in Urdu has not been completed as the questionnaire was provided in Urdu translation, but there is not any data

reported regarding its psychometric properties in Urdu for this sample. Fifth, prior exposure to health information, family history of dementia and caregiving experience were not measured and are potential effect modifiers of AD knowledge.

5. Conclusion

This study shows that the knowledge about Alzheimer's diseases among adult community dwellers of Lahore is alarmingly low, as the correct response rate is only 37.3% in the validated ADKS. The areas of weakness are those relating to life impact and symptom recognition, both of which have direct implications for early detection and safe caregiver. There are considerable differences in education by gender, age, education level, place of residence and marital status, which indicates the need for differentiated, population-specific education interventions. The toll of Pakistan's increasing burden of dementia, due to demographic ageing, is being felt at a dramatic pace and these findings are an important evidence base for developing targeted community-based health messages and incorporating dementia literacy into Pakistan's national health policy.

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