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ORIGINAL RESEARCH

Knowledge, Attitudes, and Practice of General Practitioners Toward Screening of Age-Related Hearing Loss in Community: A Cross-Sectional Study in Shanghai, China

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Background: Age-related hearing loss (ARHL) is experiencing a continuously rising in prevalence among the elderly worldwide. General practitioners (GPs) may have a unique position in its community detection and management.

Objective: This study aims to assess the KAP of GPs regarding ARHL through questionnaire, to investigate the role of them in the management and to propose strategies for the hearing screening within the community.

Methods: An online survey was administered to 1173 GPs, selected from 56 community health centers (CHCs) in Shanghai during April to June 2022. A scale endorsed by a panel of multidisciplinary experts was used to assess knowledge (7 items), attitudes (12 items), and practice (10 items). A mean score was computed and converted into a scale ranging from 0 to 100. Odds ratios (ORs) were calculated for potential predictors of higher levels of KAP scores (with mean value as a cutoff point) through logistic modelling.

Results: A total of 1022 GPs completed the questionnaire with response rate 87.13%. The average scores are 69.90 ± 32.27, 66.09 ± 7.15, and 59.89 ± 21.99 for Knowledge, attitude, and practice, respectively. 24.3% of participants achieve a complete score of knowledge, whereas 5.48% receive zero. 11.6% consider ARHL as not a disease. Above 30.0% are not familiar with the screening tool. 10.8% refuse to undergo hearing screening. Higher levels of compliance in practice are found in the participants with higher levels of knowledge (OR=1.409, p=0.000) and more favorable attitude (OR=1.028, p=0.000). Male (OR=0.708, p=0.036) is associated with lower levels of attitudes.

Conclusion: GPs have a low level of ARHL knowledge, a lack of positive attitude towards the detection and management of it, and lower awareness in practice. Further research is required to gain a more comprehensive understanding of the attitudes held by GPs and explore more accessibility strategies.

Keywords: age-related hearing loss, KAP, general practitioners

Background

The phenomenon of population aging has emerged as a significant demographic shift since the latter part of the twentieth century, presenting a formidable challenge for numerous nations. ARHL is a term used to describe the deterioration of auditory capabilities that occurs as a result of aging. It is considered the third most prevalent chronic condition among older adults, following hypertension and arthritis[1–3,] The 2nd WHO Cooperative Center for Deafness Prevention StrategicPlanConference unveiled findings indicating that mild instances of deafness among the elderly can impede their communication skills and hinder their ability to carry out basic daily activities. Furthermore, in more severe cases, it was observed that deafness may contribute to the development of psychological disorders such as depression.[4–7] The

incidence of Alzheimer's disease in older adults with varying degrees of hearing loss, specifically mild, moderate, and severe, is found to be twice, three times, and five times greater, respectively, contrasted to older adults with normal hearing capacity. There is a possibility that it could potentially elevate the likelihood of mortality from any cause among the elderly population.[2,3,8] ARHL is distinguished by bilateral symmetrical hearing impairment predominantly affecting high-frequency sounds, some of which may be accompanied by tinnitus. The capacity for early subjective sensory speech recognition can effectively facilitate daily communication, albeit with symptoms that are often subtle and easily over-looked. It is anticipated that implementing active early screening and intervention measures will decelerate this progression, diminish the prevalence of disability, and enhance the overall life quality.[9–13]

Hearing screening of newborns in primary health care centers has been carried out for more than 20 years and achieved satisfactory clinical outcomes, while the hearing screening of older adults is still in the primary stage.[14–16] With the promotion and implementation of the graded diagnosis and treatment system, GPs have become the first people for various health problems of community residents. However, hearing screening and timely and appropriate referral for older adults have not been popularized or valued in primary care.[17,18] Up to 85% of elderly patients reported that they did not receive further advice on hearing loss from GPs.[19–21] In a cohort study in Australia, less than half of patients consulted by GPs received referral and further treatment for hearing loss.[18] This situation may be caused by time constraints, a lack of adequate training in hearing screening and treatment, and the GPs' need to pay attention to more urgent medical problems, etc.[19–21]

Despite the fact that blood pressure or total cholesterol levels are widely understood, respondents demonstrate a lesser comprehension of what constitutes "normal" hearing levels. The prevailing viewpoint among respondents is that there is a limited range of treatment options available for the management of hearing loss. There is a notable absence of recognition regarding the enduring health consequences that can arise from the failure to address untreated hearing impairment.[22] Like chronic diseases such as hypertension and diabetes, the incidence rate of ARHL is high, the onset of it is related to various personal behavioral and disease factors, which is relatively irreversible and cannot self-heal. Although it cannot be implementing primary prevention accurately, it can be screened, intervened, and delayed. The management of ARHL can refer to the current management guidelines for NCDs. Relying on the primary health care, screening and management in community led by GPs is feasible and has significant advantages.

Currently, there exists a series of studies on the various screening techniques for ARHL[23–26] as well as the health beliefs held by individuals with hearing loss.[27,28] However, there is a dearth of evaluations pertaining to the knowledge, beliefs, and practices (KAP) of GPs in relation to ARHL. The study aims to assess the proficiency of GPs in Shanghai in terms of their knowledge, attitudes, and practices linked to the detection and management of ARHL. Additionally, the study also will explore the potential associations between these factors, with the ultimate goal of offering fundamental guidance for the implementation and enhancement the hearing loss screening of the elderly population within the community.

Materials and Methods

Study Participants

Shanghai comprised a total of 16 districts and 251 community health centers (CHCs), among which Pudong emerged as the largest district, boasting a CHC count that was twice the average of the remaining districts. The research employed a stratified cluster sampling technique in order to recruit participants, ensuring proportional representation based on the distribution of areas. Specifically, six CHCs were randomly chosen from the Pudong district, while three CHCs were chosen from the remaining districts. There was a total of 51 CHCs, with approximately 1173 GPs being recruited.

Study Instruments

The questionnaire was developed through the literature review about ARHL detection and management in GPs,[2–10,15–26,29,30] and the related books (Hearing Rehabilitation of the Elderly[31] and Basic and Clinical Audiology[32]). The adaptation of the intervention to the Chinese context was achieved by conducting focus group interviews with a total of 15 individuals diagnosed with ARHL and 20 caregivers, as well as 20 GPs and 15 CHC managers in Shanghai. Subsequently, a series of two Delphi consultations were conducted, involving a panel of 22 experts who possessed expertise in general practice, ENT or health system and services management. The efficacy of KAP measurement was ensured by adhering to the four criteria

proposed by Collier and Bienstock:[33] content specification, indicator specification, indicator collinearity, and external effectiveness. The study employed a comprehensive literature review and conducted focus group interviews in order to maintain the integrity of pertinent content. The Delphi consultation facilitated the establishment of clear indicators.

Ten questionnaires were pretested in two CHCs, respectively, and the problems found were revised and adjusted in time.

The questionnaire was comprised of four sections and contained 39 items:1) General information of participants; 2) Knowledge of GPs toward ARHL detection and management; 3) Attitudes of GPs toward ARHL detection and management; 4) Practice of GPs toward ARHL detection and management (Additional File 1).

General information of participants contained as follows: gender, age, marital status, educational level, professional title, years of GPs experience, a unit of work, daily patient visits, the proportion of patients with self-reported hearing loss, ARHL detection and management experience or training.

The assessment of knowledge pertaining to ARHL was conducted using a set of seven question items. These items encompassed various aspects of ARHL, including its prevalence, risk factors, diagnostic criteria, classification, associated hazards, screening tools, and intervention measures. One possible option is to include the term "uncertain" in order to discourage individuals from making guesses. Each correct answer was assigned a score of 1, while incorrect answers were assigned a score of 0. The aggregate score was computed and converted into a scoring framework that spans from 0 (indicating the lowest level of knowledge) to 100 (representing the highest level of knowledge). In addition, the participants were requested to assess their level of knowledge in ARHL using a visual analog scale, which spanned from 0 to 100.

The attitudes of individuals with ARHL were assessed using a set of 12 items. These items encompassed various aspects, such as the perceptions of GPs regarding the nature of the condition (including susceptibility, severity, and benefits of interventions), the potential societal responses and burdens associated with ARHL, as well as the necessary actions to be taken by healthcare providers. The participants were asked to rate each item using a five-point Likert scale, with options ranging from 1, indicating "strongly disagree", to 5, indicating "strongly agree". The total score was computed and converted into a scoring system that spans from 0 (indicating the least favorable attitude towards ARHL management) to 100 (indicating the most favorable attitude towards ARHL management).

The assessment of ARHL was conducted across three distinct domains, namely alerting, confirming, and managing. The domain dedicated to alerting included two questions that inquired about respondents' inclination to receive notifications for initiating ARHL screening by tinnitus and difficulty in listening under noise, respectively, for suspected cases. These symptoms were common early complaints in ARHL patients.[2–10,15–29] The participants were instructed to evaluate each item utilizing a five-point Likert scale, where the response options spanned from 1 ("never / not applicable") to 5 ("always"). The total score for the alerting domain was computed and subsequently converted into a scoring system that spans from 0 (indicating low alertness) to 100 (indicating high alertness). The domain of confirmation encompassed three components that addressed the evaluation of risk factors, the process of screening, and the referral of patients to specialists for diagnostic purposes. The participants were asked to rate each item using a five-point Likert scale, with response options ranging from 1 ("never/not applicable") to 5 ("always"). The cumulative score was computed for the confirming domain and converted into a scoring framework that spans from 0 (indicating low compliance) to 100 (indicating high compliance). The managerial domain encompassed four components pertaining to patient and family communication, service coordination, and non-pharmacological interventions. The participants were asked to rate each item using a five-point Likert scale, with response options ranging from 1 ("never/not applicable") to 5 ("always"). The managing domain was evaluated by computing a summed score, which was subsequently converted into a scoring system that spans from 0 (indicating low compliance) to 100 (indicating high compliance). The researchers computed the mean score of the three practice domains, where a higher score denoted greater adherence to the pertinent clinical guidelines.

The covariates assessed in this study encompassed sociodemographic attributes and the professional background of the participants. The sociodemographic characteristics measured were gender (female, male), age (< 30, 30–39,40–49, ≥ 50), marital status (married, unmarried, other), educational level (below bachelor, bachelor, postgraduate), professional title (primary, middle, associate senior, senior), years of general practice experience (< 5, 5–9, 10–14, ≥15), unit of working (urban of Pudong district, suburb of Pudong district, urban of Puxi district, suburb of Pudong district). Work experience measured included the volume of daily visiting patients (< 50, 50–69, 70–89, 90–109, ≥ 110), the proportion

of patients with self-reported hearing loss over the past month (0, < 10%, 10–29%, ≥ 30%, unsure) and past experience or training in ARHL detection and management (yes, no).

Data Collection

The survey was conducted through the Sojump platform, and an email was sent before the survey, accompanied by a consent form explaining the research purpose and procedures, for respondents to read the survey before deciding to continue. The average survey time was about 10 minutes.

Statistical Analysis

The data input process was conducted using EpiData 3.0, while statistical analysis was performed using SPSS 25.0 software. In the context of measurement data, the normal distribution was represented as x ± s, whereas the abnormal distribution was represented as *M (P25, P75)*. The classified information was represented using measures of frequency and rate. The application of an independent-sample *t*-test is appropriate when comparing only two groups, while comparisons among multiple groups are analyzed using a two-way *ANOVA*. T-test was used for independent samples of normal distribution data, and analysis of variance was used for diversity samples of normal distribution data. Correlation analysis and logistic regression analysis were employed to examine the factors that are linked to each other. $P < 0.05$ indicates that the observed difference is statistically significant.

Results

Sociodemographic Characteristics of Participants

The survey includes a cohort of 1173 participants, with 48 individuals declining to participate and 103 individuals withdrawing from the study prior to its completion. The data analyses were conducted using a final sample size of 1022, which accounts for approximately 11.6% of the total number of GPs in Shanghai.[34] Among participants, the majority are female (69.4%); average age (37.5 ± 8.1 years old), of whom 70.6% are 30–49 years old; 86.7% have bachelor's degrees and 12.6% have graduate degrees; 11.1% of individuals possess a working experience of 15 or more years, in contrast to 31.1% who have accumulated 10–14 years of experience, 29.4% with 5–9 years of experience, and 28.5% with less than five years of experience. Over two-thirds (77.6%) have a midcareer and above professional title. Less than 50% of participants saw more than 90 patients per day on average; the majority of them (91.9%) are uncertain about the status of self-reported hearing loss patients in the past month, and only 1.6% have ARHL detection and management experience (Table 1).

Test-Retest Reliability

In this study, 42 respondents are reinvestigated repeatedly, with an interval of 7 days. The two measurement scores are evaluated by Pearson correlation analysis. The correlation coefficient of the retest reliability of the total questionnaire is 0.863. The correlation coefficient of retest reliability of three dimensions is between 0.815–0.845, indicating that the questionnaire results have good stability and consistency.

Table 1 Characteristics of GPs Enrolled in the Study (n = 1022)

Items	Participants (n, %)
Gender	
Male	243 (23.8%)
Female	779 (76.2%)
Age	
20–29	229 (22.4%)
30–39	360 (35.2%)
40–49	362 (35.4%)
≥ 50	71 (6.9%)

(Continued)

Table 1 (Continued).

Items	Participants (n, %)
Marital status	
Unmarried	165 (16.1%)
Married	848 (83.0%)
Other	9 (0.9%)
Educational level	
Below bachelor	68 (6.7%)
Bachelor	825 (80.7%)
Postgraduate	129 (12.6%)
Professional title	
Primary	229 (22.4%)
Middle	733 (71.7%)
Associate senior or above	60 (5.9%)
Years of GP experience	
< 5	291 (28.5%)
5–9	300 (29.4%)
10–14	318 (31.1%)
≥ 15	113 (11.1%)
Unit of working	
Urban of Pudong district, Shanghai	258 (25.2%)
Suburb of Pudong district, Shanghai	278 (27.2%)
Urban of Puxi district, Shanghai	244 (23.9%)
Suburb of Puxi district, Shanghai	242 (23.7%)
Daily visiting patients	
< 50	284 (27.8%)
50–69	246 (24.1%)
70–89	329 (32.2%)
90–109	110 (10.8%)
≥ 110	53 (5.2%)
Proportion of patients with self-reported hearing loss over the past month	
<10%	70 (6.8%)
10–29%	9 (0.9%)
≥ 30%	4 (0.4%)
Unsure	939 (91.9%)
ARHL detection and management experience or training	
Yes	16 (1.6%)

Knowledge of GPs Toward ARHL Screening and Management

The participants obtained a score of knowledge toward ARHL screening and management of 69.90 (SD = 32.27). A total of 24.3% of the participants were able to attain a complete knowledge score, while only 5.48% of the participants obtained a score of zero. A relatively greater level of knowledge is reflected in the question (hazards and treatment of ARHL); however, the other questions are all of lower levels. The understanding of participants on the characteristics, risk factors, and screening tool of ARHL is relatively poor, with 70.3%-76.5% of participants providing the correct answer. Less than 65% of participants understand the classification criteria for hearing loss (Table 2). The self-rated scale ARHL knowledge is also a tip on the same low level: the mean value of 61.63 (SD = 31.26) out of a maximum of 100.

The Attitude of GPs Toward ARHL Screening and Management

The participants have an average score of attitudes is 66.09 (SD = 7.15). A significant proportion of respondents (65.9%) expressed agreement or strong agreement with the statement that "All older adults suspected of ARHL should undergo a diagnostic evaluation" There are more advantages than disadvantages to screening if someone has ARHL"

Table 2 KAP of GPs Toward ARHL Screening and Management (n = 1022)

Knowledge Item	Correct (n, %)	Incorrect (n, %)	Unsure (n, %)		
What is the estimated percentage of older adults (over 60 years) who have ARHL?	453 (44.3%)	569 (55.7%)	/		
The characteristics of ARHL are?	734 (71.8%)	204 (20.0%)	84 (8.2%)		
Which is not a modifiable risk factors that affects ARHL?	782 (76.5%)	154 (15.1%)	86 (8.4%)		
Common tools for ARHL screening include?	718 (70.3%)	197 (19.3%)	107 (10.5%)		
The classification criteria for hearing loss are?	614 (60.1%)	265 (25.9%)	143 (14.0%)		
Which of the following are hazards of ARHL?	839 (82.9%)	128 (12.5%)	55 (5.4%)		
Which statement is false concerning treatment of ARHL?	861 (84.2%)	96 (9.4%)	65 (6.4%)		
All knowledge items	248 (24.3%)	3 (0.29%)	53 (5.19%)		
Total score (Mean ± SD) of knowledge:69.90 ± 32.27					
Attitude Item	**Strongly disagree (n, %)**	**Disagree (n, %)**	**Unsure (n, %)**	**Agree (n, %)**	**Strongly Agree (n, %)**
ARHL is not a disease, but a degenerative aging process	62 (6.1%)	630 (61.1%)	212 (20.7%)	98 (9.6%)	20 (2.0%)
All older adults suspected of ARHL should undergo a diagnostic evaluation	6 (0.6%)	71 (6.9%)	272 (26.6%)	605 (59.2%)	68 (6.7%)
There are more advantages than disadvantages to screening if someone has ARHL	0 (0.0%)	79 (7.7%)	275 (26.9%)	575 (56.3%)	93 (9.1%)
Early recognition and management can reduce the harm caused by ARHL	8 (0.8%)	65 (6.4%)	362 (35.4%)	528 (51.7%)	59 (5.8%)
There are more advantages than disadvantages to manage ARHL patients with risk	8 (0.8%)	74 (7.2%)	342 (33.5%)	525 (51.4%)	73 (7.1%)
There are more advantages than disadvantages to treat ARHL patients with hearing aids, cochlear implants, etc	2 (0.2%)	74 (7.2%)	599 (58.6%)	317 (31.0%)	30 (2.9%)
Older adults with ARHL can be a drain on medical and social resources	0 (0.0%)	116 (11.4%)	489 (47.8%)	380 (37.2%)	37 (3.6%)
Disclosure of ARHL could cause stress and frustration to patients and their families	12 (1.2%)	104 (10.2%)	648 (63.4%)	237 (23.2%)	21 (2.1%)
Disclosure of ARHL could cause embarrassment or discomfort for doctors	12 (1.2%)	163 (15.9%)	667 (65.3%)	159 (15.6%)	21 (2.1%)
1Detection and management of ARHL will provide no economic benefits	68 (6.7%)	297 (29.1%)	615 (60.2%)	40 (3.9%)	2 (0.2%)
It`s GPs duty to recognize ARHL in the community health center	11 (1.1%)	42 (4.1%)	200 (19.6%)	704 (68.9%)	65 (6.4%)
It`s GPs responsibility to managing ARHL in the community health center	10 (1.0%)	42 (4.1%)	271 (26.5%)	652 (63.8%)	47 (4.6%)
Total score (Mean ± SD) of attitudes:66.09 ± 7.15					
Practice Item					
Alerting practice	**Yes (n, %)**	**No (n, %)**	**Unsure (n, %)**		
I would take tinnitus as the criteria for ARHL detection	416 (40.7%)	120 (11.7%)	486 (47.6%)		
I would take difficulty in listening under noise environment as the criteria for ARHL detection	508 (49.7%)	115 (11.3%)	399 (39.0%)		
Total score (Mean ± SD) of alerting practice:45.21 ± 44.83					

Confirmation practice	Never/not applicable (n, %)	Seldom (n, %)	Sometimes (n, %)	Usually (n, %)	Always (n, %)
I would gather if a patient has family history of hearing loss disease	14 (1.4%)	94 (9.2%)	586 (57.3%)	285 (27.9%)	43 (4.2%)
I would detect risk factors of ARHL	14 (1.4%)	85 (8.3%)	551 (54.9%)	328 (32.1%)	44 (4.3%)
I would utilize the screening methods of ARHL	9 (0.9%)	101 (9.9%)	739 (72.3%)	167 (16.3%)	6 (0.6%)
I would get specialist advice for final diagnosis by referral	13 (1.3%)	54 (5.3%)	478 (46.8%)	441 (43.2%)	36 (3.5%)
Total score (Mean ± SD) of confirmation practice:65.11 ± 12.47					
Management practice	**Never/not applicable (n, %)**	**Seldom (n, %)**	**Sometimes (n, %)**	**Usually (n, %)**	**Always (n, %)**
I would discuss the probable diagnosis with the patient	11 (1.1%)	73 (7.1%)	477 (46.7%)	430 (42.1%)	31 (3.0%)
I would discuss the probable diagnosis with the family members	3 (0.3%)	66 (6.5%)	410 (40.1%)	499 (48.8%)	44 (4.3%)
I would coordinate support services	2 (0.2%)	67 (6.6%)	363 (35.5%)	534 (52.3%)	56 (5.5%)
I would provide non-pharmacological interventions	11 (1.1%)	83 (8.1%)	419 (41.0%)	486 (47.6%)	23 (2.3%)
Total score (Mean ± SD) of management practice:69.36 ± 13.25					
Summed average score (Mean ± SD) of practice:59.89 ± 21.99					

(65.4%), "Early recognition and management can reduce the harm caused by ARHL" (57.5%), "The management of patients with ARHL presents a greater number of advantages compared to disadvantages" (58.5%).

There are 67.2% of participants consider ARHL as a disease; however, 11.6% of participants still consider ARHL as a degenerative aging process. About 47.8% and 65.3% of participants held a neutral attitude towards The presence of ARHL among older individuals may impose a burden on both medical and social resources; the revelation of ARHL has the potential to induce feelings of stress and frustration among individuals and their families, respectively. About 68.4–75.3% of participants agree or strongly agree that it is GPs' duty to recognize and manage ARHL in the CHCs. However, less than 35.8% believe that detection and management would provide economic benefits. Only 33.9% agree or strongly agree with Treating patients with ARHL through the use of hearing aids and cochlear implants offers a greater number of benefits compared to drawbacks, meanwhile, 58.6% hold a neutral attitude (Table 2).

The Practice of GPs Toward ARHL Screening and Management

On average, the participants have a practice score of 69.36 (SD = 13.25). Less than half of the participants are likely to be alerted by the existence of tinnitus (40.7%) or difficulty in listening in a noisy environment (49.7%) for suspected ARHL cases.

Meanwhile, less than half of the participants would always or usually gather the family history of hearing loss disease (32.1%) and detect the risk factors of ARHL (36.4%). Less than one-fifth of participants would always or usually perform ARHL screening (16.9%) but prefer to refer suspected ARHL patients to specialists (46.7%). About 10.8% of respondents would never or seldom conduct ARHL screening. Approximately 53% of the participants indicated a tendency to consistently or frequently engage in conversations regarding ARHL diagnosis with their family members, in contrast to 45.1% who reported similar discussions with the patients themselves. More than half of the participants would usually or always take coordinate support services (57.8%) and non-pharmacological measures (49.9%) (Table 3).

Table 3 ARHL KAP Scores by Sociodemographic Characteristics of Participants

Characteristics	Knowledge Scores				Attitude Scores				Practice Scores			
	Mean	SD	F/t	P	Mean	SD	F/t	P	Mean	SD	F/t	P
Gender			0.198	0.843			1.156	0.248			0.481	0.630
Male	69.55	32.07			66.56	7.13			60.49	22.34		
Female	70.02	32.36			65.95	7.13			59.71	21.89		
Age			85.222	0.000			22.297	0.000			16.904	0.000
20–29	49.84	35.19			66.01	7.74			59.44	21.70		
30–39	64.09	31.78			65.52	7.67			59.44	21.70		
40–49	86.98	21.52			68.00	5.65			64.59	21.61		
≥ 50	77.06	23.35			66.08	7.19			63.76	21.33		
Marital status			6.779	0.000			4.061	0.000			2.548	0.011
Unmarried	53.16	35.37			64.04	6.99			55.91	21.43		
Married	73.13	30.63			66.49	7.11			60.66	22.03		
Educational level			30.533	0.000			5.777	0.003			2.836	0.059
Below bachelor	41.18	27.87			66.38	7.58			59.80	23.50		
Bachelor	71.91	32.86			66.20	6.96			60.57	21.94		
Postgraduate	72.70	21.97			66.86	7.79			55.62	21.22		
Professional title			68.033	0.000			25.936	0.000			19.846	0.000
Primary	49.84	35.19			63.22	7.34			51.99	21.05		
Middle	74.88	29.50			66.83	6.72			62.10	21.64		
Senior	85.71	18.03			68.06	8.57			63.17	23.07		
Years of GPs experience			106.756	0.000			22.749	0.000			17.538	0.000
< 5	55.67	32.93			64.38	7.84			52.95	20.82		
5–9	61.52	34.46			65.44	7.52			59.95	22.04		
10–14	93.04	10.63			68.69	5.16			65.41	21.35		
≥15	63.72	30.43			64.96	7.14			62.09	22.01		

(Continued)

Table 3 (Continued).

Characteristics	Knowledge Scores				Attitude Scores				Practice Scores			
	Mean	SD	F/t	P	Mean	SD	F/t	P	Mean	SD	F/t	P
Unit of working			21.616	0.000			4.005	0.008			1.924	0.124
Urban of Pudong district	77.13	25.79			66.31	7.42			62.07	23.27		
Suburb of Pudong district	59.45	36.66			65.57	7.14			57.63	21.31		
Urban of Puxi district	78.04	25.34			67.18	6.61			60.53	21.77		
Suburb of Puxi district	66.00	35.29			65.44	7.17			59.54	21.46		
Daily visiting patients			49.490	0.000			16.022	0.000			12.098	0.000
< 50	53.12	34.61			63.52	7.46			52.92	21.31		
50–69	63.36	30.98			65.86	5.77			59.70	22.15		
70–89	82.89	26.99			67.24	5.50			63.61	21.35		
90–109	83.12	21.48			68.06	6.10			64.41	21.51		
≥110	83.21	22.74			68.30	6.66			65.75	20.96		
Proportion of patients with self-reported hearing loss over the past month			1.489	0.216			0.585	0.625			0.546	0.651
<10%	71.84	32.54			66.52	8.84			62.64	23.34		
10–29%	82.54	18.60			68.52	3.28			64.26	20.33		
≥ 30%	96.43	7.14			68.33	4.91			56.66	21.26		
Unsure	69.53	32.37			66.03	7.04			59.66	21.92		
ARHL detection and management experience			1.754	0.080			2.585	0.019			1.146	0.252
No	69.68	32.29			66.05	7.18			59.79	22.02		
Yes	83.93	28.99			68.65	3.91			66.15	20.08		

Sociodemographic Characteristics Connected to KAP (Knowledge, Attitude, and Practice)

Age is linked to knowledge (P=0.001), attitudes (P =0.001), and practice (P =0.013) scores, and all of them are in a linear manner. Greater knowledge scores, lower attitudes, and practice scores are observed in the female participants, but the difference is not statistically significant. Higher KAP scores are also found in those who are married (P =0.000, 0.000, 0.011). Postgraduates among the participants are associated with higher knowledge (P =0.000), attitudes (P =0.003), and practice (P =0.059) scores compared to bachelor or below bachelor. Similarly, higher professional titles are associated with greater knowledge scores (P =0.000), attitude scores (P =0.000), and practice scores (P =0.000). The participants who have 10–14 years of GP experience have greater KAP scores (P <0.001). Those who worked in the urban districts had greater knowledge scores (P =0.000) and greater attitude scores (P =0.008). The more daily visiting patients the participants have, the higher KAP scores they get (all P =0.000). The participants who experienced ARHL detection and management would get higher KAP scores but differences with no statistical significance.

The multivariate logistic regression model confirms that male (OR=0.708, P =0.036) is linked to reduced levels of attitudes. Being married is linked to levels of practice (OR=1.549, P =0.057). Educational level (Bachelor) is linked to greater levels of knowledge (OR=1.106, P =0.000); the same trend can be seen among postgraduates with higher levels of KAP, but there is no difference in statistics. (Table 4).

Working in an urban unit is a significant predictor of higher levels of knowledge (OR=−1.277, P =0.000), more positive attitudes (OR=1.703, P =0.014), and higher compliance in practice (OR=1.053, P =0.037).

The model also shows that higher levels of attitude scores are observed in the participants with greater knowledge (OR=2.305, P =0.000). Greater compliance levels in practice are observed in the participants with greater knowledge levels (OR=1.409, P =0.000) and more favorable attitudes (OR=1.028, P =0.000) (Table 4).

Discussion

The study included 1022 GPs, who cover different ages, years of work, educational backgrounds, and position titles, making the study participants representative. The finding shows that scores (Mean ± SD) of knowledge, attitudes, and practice were all less than 70. GPs possess a reduced ARHL knowledge level, a lack of a positive attitude towards the

Table 4 Logistic Regression Results of Predictors of ARHL KAP Scores

Characteristics	Knowledge Levels (low vs high)				Attitudes Levels (Low vs High)				Practice Levels (Low vs High)			
	P	OR	95% CI		P	OR	95% CI		P	OR	95% CI	
Gender												
Female		1				1				1		
Male	0.460	0.864	0.587	1.272	0.036	0.708	0.513	0.978	0.187	0.816	0.603	1.104
Age												
20–29		1				1				1		
30–39	0.999	1	0.000	–	0.999	3,080,605,501.602	0.000	–	0.999	1,691,165,172.959	0.000	–
40–49	0.999	1	0.000	–	0.999	4,828,066,544.055	0.000	–	0.999	2,652,824,901.607	0.000	–
≥ 50	0.603	1.759	0.210	14.756	0.591	0.718	0.214	2.409	0.942	0.958	0.303	3.027
Marital status												
Unmarried		1				1				1		
Married	0.865	0.961	0.609	1.518	0.452	1.187	0.759	1.855	0.057	1.549	0.988	2.428
Educational level												
Below bachelor		1				1				1		
Bachelor	0.000	1.106	1.002	2.120	0.075	0.357	0.115	1.107	0.390	0.614	0.202	1.866
Postgraduate	0.403	1.321	0.689	2.533	0.082	0.586	0.320	1.071	0.467	0.799	0.437	1.462
Professional title												
Primary		1				1				1		
Middle	0.135	1.021	0.318	7.523	0.490	1.185	0.431	2.104	0.631	1.002	0.471	1.637
Associate senior or above	0.286	2.143	0.528	8.698	0.510	1.273	0.621	2.609	0.953	1.081	0.510	1.885
Years of GP experience												
< 5		1				1				1		
5–9	0.999	204,548,699.708	0.000	–	0.999	0.000	0.000	–	0.999	0.000	0.000	–
10–14	0.999	205,913,384.735	0.000	–	0.999	0.000	0.000	–	0.999	0.000	0.000	–
≥ 15	0.111	6.856	0.642	73.201	0.040	3.421	1.056	11.082	0.847	1.118	0.360	3.466
Unit of working												
Suburb district		1				1				1		
Urban district	0.000	1.277	1.117	2.051	0.014	1.703	1.530	3.932	0.037	1.053	1.577	1.983
Daily visiting patients												
< 50		1				1				1		
50–69	0.189	1.178	0.014	4.339	0.001	1.120	1.035	3.411	0.049	1.333	1.111	3.996
70–89	0.174	2.174	0.013	5.158	0.005	1.197	1.064	4.605	0.078	1.415	0.156	4.104
90–109	0.123	1.147	0.013	4.682	0.207	1.553	0.220	2.388	0.163	1.570	0.258	5.256
≥ 110	0.743	0.737	0.119	3.560	0.313	1.649	0.281	2.501	0.280	1.663	0.314	5.398
ARHL detection and management experience												
no		1				1				1		
yes	0.415	2.512	0.275	22.988	0.156	1.181	0.017	2.924	0.134	1.254	0.042	3.525
Knowledge scores levels												
Low						1				1		
High					0.000	2.305	1.575	3.374	0.000	1.409	1.272	2.615
Attitude scores Levels												
Low										1		
High									0.000	1.028	1.018	2.042

detection and management, and lower awareness in practice. Thus, the KAP towards ARHL of GPs in Shanghai is worrying.

With the rising in the incidence rate, ARHL has been a worldwide concern. But, poor knowledge of ARHL among GPs is a problem. From the study data, it could be seen that only 24.3% of participants achieved a full knowledge score, while 5.48% obtained a zero score. Only 70% know the classification criteria for ARHL, and 71.8% know the characteristics of ARHL. Above 30.0% are not familiar with the screening tools for ARHL. The cross-sectional survey of Australian GPs from Schneider JM et al also shows that GPs have opportunities to identify hearing loss, but they have low knowledge of ARHL management[18]. An international study of staff of long-term-care (including GPs) in six countries, England, South Korea, India, Greece, Indonesia, and Australia, reveal that most healthcare professionals are aware that their dementia patients have hearing impairments and need screening tests. Nevertheless, their understanding of conducting screening tests and interpreting the outcomes is limited.[35,36] Meanwhile, a majority of participants express a lack of confidence in their ability to assist residents with the utilization of assistive hearing aids. This lack of confidence primarily stems from a perceived deficiency in training.[35,36] In our study, there are similar conclusions as well, only 1.6% have ARHL detection and management experience or training. Therefore, health authorities need to develop relevant continuing medical education and link training effectiveness to performance.

Depending on the outcomes of the study, it is observed that GPs in Shanghai do not exhibit explicitly positive attitudes toward the detection and management of ARHL. The average attitudes score is only 66.09 ± 7.15. 11.6% of the study participants do not consider ARHL as a disease, but over one-fifth (20.7%) of the study participants hold a neutral position. The investigation into the attitudes of Australian GPs regarding the discussion of hearing-related matters revealed a lack of comprehensive understanding regarding the implications of hearing loss and the advantages of hearing technology. Additionally, it was observed that these practitioners occasionally made assumptions that older individuals would not prioritize addressing their hearing concerns.[21,37] Similar findings in the USA indicated that most GPs were unaware of how to or when to detect hearing loss.[37,38] Our study also shows that whether suspect ARHL should undergo detection, 26.6% still hold a neutral attitude. There is a positive sign, though, that more than 68% of participants endorse their function in ARHL recognition and management, contrasted with < 6% clearly objecting to the study.

However, there is still some confusion and barriers for GPs to fulfill the role. Data from our study shows that 33.5% −58.6% hold a neutral attitude towards the opinion of" more benefits than drawbacks to manage and treat ARHL."A partial proportion of GPs worry about disclosure of ARHL diagnosis to patients and families (17.7%) or thought disclosure of ARHL diagnosis to patients and families would cause stress and frustration (25.3%). The National Academies of Science consensus paper confirmed the importance of identifying and treating hearing loss,[39] though 60.2% of the participants are skeptical about the economic benefits of ARHL detection.

From the study, we find that there exists a correlation between lower levels of ARHL knowledge and the presence of unfavorable attitudes, which aligns with previous research conducted by Dawes et al[36] In KAP theory, if the prevalence and severity of ARHL are underestimated, it might weaken the GPs' understanding and recognition of the importance of detection and management of ARH. A lack of knowledge and confidence in ARHL detection and management might lead to a pessimistic attitude among GPs. Doubting the effectiveness of ARHL detection and management, as well as the uncertainty of benefits, could exacerbate the hesitation of GPs towards ARHL detection and diagnosis.

Dawes P et al[36] found that only staff experience and having received training were associated with capacity. Our investigation shows that higher education level and professional title, longer general practitioner experience, urban working, and more daily visiting patients were linked to more favorable attitudes toward ARHL detection and management, which may be related to more residents' medical needs and more opportunities for continuing education. Participants with experience in ARHL detection and management would get higher KAP scores but differences with no statistical significance. This might be a bias caused by an imbalanced sample size.

The self-reported practice intentions of GPs regarding community detection and management of ARHL reveal a notable lack of compliance with recommended practices. Only 40.7% of participants would take tinnitus as the criteria for ARHL detection, and only 49.7% of them would take difficulty in listening in a noise environment as the criteria in our study.

This finding is similar to those studies in the USA. A patient could only become part of a community ARHL management program when they received confirmation of ARHL diagnosis following the screening. But in their consultations, GPs usually do not doubt or consider this to be important.[40,41.]

Unfortunately, our study finds that only 16.9% of the participants would utilize the screening methods, while 10.8% would never or seldom perform the screening. Meanwhile, less than 40% of the participants would gather a family history of hearing loss (32.1%) and detect risk factors (36.4%) of ARHL.

Previous studies also suggested that 75% of cases of hearing loss are not adequately diagnosed or treated. The implementation of widely used screening methods has demonstrated efficacy in accurately identifying individuals with hearing loss, but they were rarely used.[40–42] Although some studies called on GPs to pay more attention to improving the detection rate and intervention rate of hearing loss,[43,44] there seemed to be no practical management plan. In the medical consultation of GPs, an average of 1.5 health problems needed to be handled 43.44. They lacked time and needed to prioritize more urgent health conditions. Because hearing loss is invisible, patients usually do not ask the GPs about hearing problems spontaneously, so it is not surprising that the GPs will detect patients' hearing loss irregularly.

From the "Knowledge, attitude, practice" theory, it is the most difficult and a challenging stage to change from believing in the knowledge to acting; the failure of transformation is often an important factor leading to the poor effect of chronic disease prevention and control.[45,46] Our study shows similar results, indicating that participants with greater knowledge exhibited higher levels of attitude scores. Additionally, participants with more favorable attitudes demonstrated higher levels of compliance in practice. Therefore, strengthening the homogenization training and learning of GPs in otorhinolaryngology expertise and using various ways to improve the construction of GPs' talent team are the premise and key ways to improve the ability of GPs to actively participate in hearing loss screening.

Conclusion

ARHL was described as an imperceptible disability. Many adults have lived for years or even decades under the psychosocial influence of uncontrollable hearing loss.[47] Hearing screening for the older adults can improve the detection rate of hearing loss and increase the proportion of receiving hearing loss compensation treatment (including hearing aids).[17,48] In light of the demographic shift towards an aging population in Shanghai and the rising prevalence of ARHL, our study reveals that GPs in Shanghai are inadequately equipped to assume the responsibilities associated with this condition. In general, their level of knowledge in ARHL is relatively limited. There is a noticeable absence of clearly positive attitudes towards the detection and management of ARHL.

While continuous medical education can play an important role in the development of ARHL detecting and management in community, training by itself is not enough. Training alone does not foster positive attitudes that mediate the association between knowledge and practice.

Future research endeavors should take into account the utilization of more sophisticated approaches, such as the implementation of electronic health record (EHR) systems. These systems have the capability to notify healthcare professionals to conduct screenings for ARHL in individuals aged 55 years or older using a validated single-question screener.[17,49] Such as the Chronic Care Model,[50] ARHL can be reference to the management model of chronic diseases, requires a systems approach involving the patients, care providers, and a platform that enables effective interactions between the two. The major purpose of such a team-based partnership approach is to improve the quality (continuity and coordination) of care, but it may also bring benefits to the patients in resource-poor settings through its "offset effect" on the demand of the already scarce infrastructure and qualified medical workforce.[51]

Strengths and Limitations

This research endeavor represents the inaugural attempt to examine the KAP of GPs in Shanghai regarding the testing and management of ARHL within the community setting.

Although it follows strict research protocol design and tool development, there are still some limitations.

Firstly, the collection of data was conducted through the utilization of a self-report questionnaire, a method that has the potential to introduce recall bias and reporting errors.

Secondly, there is a higher proportion of females with a bachelor's degree or above participants. This demographic composition may lead to an overestimation of the knowledge level among GPs even though the overall knowledge level regarding ARHL in this sample is already considered to be low.

Third, Shanghai is widely recognized as one of the most advanced and prosperous regions within the China. It is imperative to exercise caution when attempting to extrapolate the findings to other regions within China. There is a recommendation to augment the number of participants hailing from diverse geographical regions and varying socio-cultural backgrounds.

Finally, it is important to note that training alone does not cultivate favorable attitudes that serve as mediators of the links between knowledge and practice. Further researches are required to gain a more comprehensive understanding of the attitudes held by GPs and its influencing factors in Shanghai. Relevant management policies need to be proposed by the health authority and explore more accessibility, executable and homogeneous screening management approach.

Abbreviations

ARHL, Age-related hearing loss; GPs, general practitioners; CHCs, community health centers.

Data Sharing Statement

The entirety of the data produced or examined throughout this research endeavor has been incorporated within this published scholarly article, along with its accompanying Supplementary Information. Consensus among all authors is reached regarding the practice of sharing data.

Consent for Publication

All participants provided written informed consent for the publication of their data.

Ethical Considerations

The research obtained ethical approval and ensured that participants offered informed consent before their participation. Before the initiation of the current investigation, the requisite ethical clearance was obtained from the Academic Ethics Committee of Shanghai East hospital, specifically identified as {No. [2021] (094)}. It is important to note that the current study does not encompass any ethical concerns.

The execution of my submission adhered to the principles outlined in the Declaration of Helsinki.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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