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Knowledge, attitude, and practice of Iranian health care workers about infodemic management: a cross-sectional descriptive study

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Abstract

Background Misinformation (infodemics) can hinder effective healthcare delivery. This study assessed Iranian healthcare workers' (HCWs) knowledge, attitude, and practice (KAP) regarding infodemic management (IM).

Method A cross-sectional survey using a self-reported questionnaire (KAPIM) distributed via convenience sampling to 1890 HCWs across all Iranian Medical Sciences Universities.

Results The results showed that healthcare workers demonstrated overall KAP scores with a mean of 3.38 out of 5. Knowledge scores were 63.01%, attitude scores were 74.23%, and practice scores were lower at 55.76%. There were positive correlations between age and work experience with both knowledge and attitude scores.

Conclusion These findings suggest a gap between HCWs' knowledge/attitude and practice regarding IM. Targeted interventions emphasizing practical skills are needed. Considering demographics and regional variations is crucial when developing training programs for enhanced infodemic preparedness across the Iranian healthcare system.

Keywords Infodemic management, Health care workers, Knowledge, Attitude, Practice

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Background

Infodemics, characterized by the rapid spread of misinformation during an epidemic or pandemic, pose significant risks to public health [1]. The crucial role of healthcare professionals in mitigating infodemics is clear, yet there is a lack of comprehensive understanding regarding their awareness, perspectives, and strategies for infodemic management [2, 3]. Healthcare workers (HCWs) are vital to the effectiveness of health systems, especially during epidemics [4, 5]. Healthcare workers (HCWs) in Iranian communities and health systems consistently rank among the most trusted sources of health information. Their direct, face-to-face interactions with patients in clinics, hospitals, and community settings, such as local focus groups and religious gatherings, provide them with unique opportunities to address health misinformation and promote accurate information. Healthcare professionals often serve as informal health educators, participating in community events, religious activities, and social media discussions. The COVID-19 pandemic further highlighted their critical role in disseminating accurate health information. By equipping HCWs with the knowledge and skills necessary to address health misinformation, we can enhance their ability to promote evidence-based practices and foster public trust in health information. Therefore, this study focuses on HCWs to leverage their potential role in social vaccination and improving community and organizational health literacy in combating infodemic. HCWs provide numerous services to patients and clients, with one of their most important roles being the dissemination of education and information, particularly in critical situations like epidemics [6, 7]. The COVID-19 pandemic has brought unprecedented global challenges, affecting not only healthcare infrastructures but also individuals striving to stay well-informed and safe [8]. In this context, the infodemic—marked by the rapid spread of misinformation, disinformation, and rumors about the pandemic through various channels, especially social media—has emerged as a significant public health emergency [9]. Healthcare workers are uniquely positioned to address and manage the infodemic, utilizing their knowledge, attitudes, and practices [10]. Research in Iran indicates that social media users primarily spread rumors, and the lack of a reliable and authoritative news source is a key reason for the emergence of rumors [11, 12]. The importance of managing infodemics and rumors in healthcare has gained increased attention, especially during the COVID-19 pandemic [13]. Analysis of risk communication strategies used by different countries during the COVID-19 emergency highlights the need for a well-planned and relevant approach to rumor control [14]. Given the existing gaps between the public and the media, as well as reliable news sources, the involvement of proactive healthcare providers who communicate with the public is crucial in navigating infodemics. Healthcare professionals must quickly, accurately, and transparently counter rumors to curb the spread of misinformation and mitigate the effects of the infodemic [15, 16].

This research aimed to assess the knowledge, attitudes, and practices of HCWs in Iran regarding infodemic management. This evaluation will help in planning educational programs, capacity building, and policy formulation for managing infodemics.

Method

Study design, and setting

This descriptive-analytical cross-sectional study was conducted in Comprehensive Health Care Centers (CHCCs) across Iran. We included a total of 64 Medical Sciences Universities, ensuring a comprehensive representation of HCWs from various regions.

Participant recruitment and inclusion/exclusion criteria

HCWs were chosen due to their pivotal role in disseminating health information, correcting misinformation, and their high level of trust within the community. They engage in direct patient education, participate in community outreach activities, and utilize digital platforms to share accurate health information. Additionally, HCWs often serve as informal health educators in community gatherings, religious events, and social media discussions. Given their significant influence, training HCWs in infodemic management is essential for enhancing their capacity to address health misinformation effectively. Inclusion criteria included HCWs being recruited in one of 64 Iranian Medical Sciences Universities, having at least one year of experience, and being a midwife, health educator, family health provider, or similar role. Participants were also required to be Iranian nationals with at least one year of experience working in a PHC with potential exposure to infodemics and a willingness to participate in the study. Exclusion criteria were limited to those unwilling to continue due to any reason or withdrawal of consent.

Sampling and sample size

Convenience sampling was employed in this study, targeting HCWs from 10 educational zones within the Iranian Primary Health Care (IPHC) system, affiliated with 64 medical universities. The IPHC system has approximately 18,000 HCWs. The initial sampling yielded 2030 completed questionnaires. After removing incomplete responses, a final sample size of 1,890 HCWs was obtained for analysis. This approach ensured that the data collected was relevant and reliable for the targeted population accessible through the Seeb platform. However, it is important to note that convenience sampling

introduces limitations to the generalizability to the entire population of Iranian HCWs. While this study's sample size of 1890 is expected to provide valuable insights into the research topic, future research efforts aiming for broader generalizability could consider employing probability sampling methods with appropriate sample size calculations. Sample size determination was conducted using Cochran's formula with parameters set as $P = 0.5$, margin of error (d) = 0.025, and confidence level (1-α) = 0.95. With a Z-value of 1.96 for a 95% confidence interval, the initial sample size calculation is:

$$n \geq \frac{Z^2 a/_2\ p\,(1-p)}{d^2} = \geq \frac{(1.96)^2 0.5\,(1-0.5)}{(0.025)^2} = \frac{3.84\ 0.25}{0.000625} = 1536$$

To account for a 20% margin of error, the final sample size is adjusted to:

1536×1.2 = 1843.2 ≈ 1844

Thus, the required sample size is 1844.

Data collection tool

Data were gathered using the KAPIM questionnaire [8], a validated instrument designed to assess the Knowledge, Attitudes, and Practices (KAP) of healthcare workers (HCWs) regarding infodemic management (IM). The KAPIM tool was developed through a rigorous process, including item generation, validation, and reduction, to ensure its accuracy and relevance. This tool assesses three critical domains of HCWs' KAP related to IM, which can inform targeted interventions to improve their preparedness and response to infodemics. Given the significant role and direct interaction of HCWs with the public, it was essential to create an instrument that could evaluate their knowledge, attitudes, and practices in IM. The KAPIM questionnaire consists of 40 items, divided into three distinct areas: Knowledge, Attitude, and Practice. The Knowledge subscale includes 24 items, where participants are asked to respond with one of three options: true, don't know, or false. Each response is assigned a score ranging from 1 to 3. The Attitude subscale contains 8 items, where participants rate their agreement with each statement on a scale of 1 to 5, with 1 representing 'completely agree' and 5 representing 'completely disagree'. The Practice subscale comprises 7 items, where participants indicate the frequency of certain behaviors on a scale of 1 to 5, with 1 representing 'always' and 5 representing 'never'.

The development of the KAPIM tool involved a mixed-method approach, beginning with item generation through two steps: a qualitative study with face-to-face interviews of 17 HCWs and a systematic review. Following this, the tool underwent psychometric property assessments, including face validity, content validity, construct validity, and reliability. The content validity ratio (CVR) and content validity index (CVI) were calculated for each item. Construct validity was evaluated through exploratory factor analysis (EFA) with the participation of 250 HCWs (6.25 participants per item). The reliability of the tool was assessed using the intraclass correlation coefficient (ICC) and Cronbach's alpha.

The KAPIM tool was found to have acceptable face validity, with an impact score for all items higher than 1.5. The tool's overall CVI and CVR were 0.94 and 0.78, respectively. The reliability of the tool was deemed adequate, with a Cronbach's alpha of 0.905 and an ICC of 0.827, confirming its suitability for assessing HCWs' knowledge, attitudes, and practices regarding IM [8].

Data collection

For data collection the online version of the questionnaire (KAPIM) was disseminated via the Seeb platform, the IPHC system's integrated health platform. To ensure data integrity, our online survey employed Avvalform's IP tracking to prevent duplicate submissions. Data collection lasted from March 15 to May 24, 2023.

Addressing potential bias

In our study, we implemented several measures to mitigate potential sources of bias:

- **Tool Validation**: We used a validated and reliable questionnaire to assess the primary variables, ensuring the accuracy of our data collection tool.
- **Online Questionnaires**: To minimize errors associated with online data collection, we restricted each participant to a single submission by using the "Avvalform" web questionnaire. This system tracked the IP addresses of respondents, removing any duplicate IPs to prevent multiple submissions from the same individual. This step was crucial in maintaining the integrity of our data by ensuring that each participant could only complete the questionnaire once.

Data analysis

The data was analyzed in SPSS software version 23 using descriptive statistics (calculating measures of central tendency and dispersion for quantitative variables and frequency and percentage for qualitative variables). At first, the normality of the variables was checked with the Kolmogorov-Smirnov test. The Kolmogorov-Smirnov test is significant for the total score and areas ($p < 0.05$). Accordingly, non-parametric tests (Mann-Whitney test, Wilcoxon test, Kruskal test) were used for data analysis.

Ethical considerations

All methods were carried out following relevant guidelines and regulations (Helsinki Declaration of Ethical Principles for Medical Research. Ethical approval was obtained from the Ethics Committee of Iran University of Medical Sciences, with the ethics code IR.IUMS.REC.1402.406. Data collection was carried out with an online questionnaire after obtaining informed consent from people who were eligible and volunteered to participate in the study.

Results

A total of initial 2030 HCWs participated in an online cross-sectional survey, but 140 participants failed to fully complete the survey or to fulfill other requirements. Thus, 1890 respondents were considered in the final analysis.

Sociodemographic characteristics

Table 1 presents the sociodemographic characteristics of the participants. The majority of participants were female (89.4%), with a significant proportion aged between 31 and 40 years (41.5%). Most participants held a Bachelor's Degree (69.0%) and had 5–10 years of work experience (24.2%).

Association between sociodemographic characteristics and KAP scores

Table 2 shows significant positive correlations between knowledge mean scores and both age and work experience, with correlation coefficients of 0.129 and 0.107 respectively, both significant at $p < 0.0001$. Similarly, there are significant positive correlations between attitude mean scores and both age and work experience, with correlation coefficients of 0.112 and 0.091 respectively, both significant at $p < 0.0001$. However, practice mean scores show no significant correlation with age or work experience, with correlation coefficients of -0.006 ($p = 0.785$) and 0.009 ($p = 0.688$), respectively. The strong positive correlation between age and work experience ($r = 0.872$, $p < 0.0001$) is also evident in the data.

Table 3 indicates a significant positive correlation between total KAP scores and age ($r = 0.080$, $p = 0.001$) and between total KAP scores and work experience

Table 1 Demographics of study participants ($N = 1890$)

	Variable	Frequency	Percent	Province		
Gender	Male	1690	89.4	Alborz	33	1.7
	Female	200	10.6	Ardabil	118	6.2
Age	< 20	2	0.1	Bushehr	123	6.5
	30 − 20	618	32.7	Chaharmahal	52	2.8
	40 − 31	784	41.5	Eats AZ	212	11.2
	50 − 41	441	23.3	Fars	41	2.2
	60 − 51	44	2.3	Golestan	40	2.1
	60 <	1	0.1	Guilan	25	1.3
Education	diploma	160	8.5	Isfahan	63	3.3
	Associate Degree	266	14.1	Hormozgan	14	0.7
	Bachelor	1304	69.0	Ilam	15	0.8
	MA	142	7.5	Kerman	97	5.1
	MD	9	0.5	Kermanshah	45	2.4
	Phd	9	0.5	Khorasan razavi	116	6.1
Experiences	< 5	185	9.8	Kordestan	67	3.5
	5–10	457	24.2	Kuzesta	46	2.4
	11–15	391	20.7	Lorestan	117	6.2
	16–20	339	17.9	Markazi	53	2.9
	21–25	191	10.1	Mazandaran	104	5.5
	26–30	198	10.5	North khorassan	30	1.6
	31 <	129	6.8	Qazvin	12	0.6
				Qom	19	1.0
				Semnan	56	3.0
				Sistan and aluchestan	67	3.6
				Tehran	127	6.71
				Urmia	106	5.6
				West Az	33	1.8
				Yasuj	12	0.6
				Yaz	26	1.37
				Zanjan	21	1.1

Table 2 Spearman's Rank correlation coefficients between knowledge, attitude, practice scores, age and work experience

		Knowledge Mean	Age	Work Exp.
		Correlation Coefficient (Sig. (2-tailed))		
Spearman's rho	Knowledge Mean	1.000	0.129** (<0.0001)	0.107** (<0.0001)
	Age	0.129** (<0.0001)	1.000	0.872** (<0.0001)
	Work Exp.	0.107** (<0.0001)	0.872** (<0.0001)	1.000
Spearman's rho	Attitude Mean			
	Age	1.000	0.112** (<0.0001)	0.091** (<0.0001)
	Work Exp.	0.112** (<0.0001)	1.000	0.872** (<0.0001)
Spearman's rho	Practice Mean	0.091** (<0.0001)	0.872** (<0.0001)	1.000
	Age			
	Work Exp.	1.000	−0.006 (0.785)	0.009 (0.688)

Table 3 Relationship between KAP score and age and work experience

			Total number	Age	Work Exp.
Spearman's rho	Total number	Correlation Coefficient	1.000	0.080**	0.073**
		Sig. (2-tailed)	.	0.001	0.002
		N	1885	1885	1885
	Age	Correlation Coefficient	0.080**	1.000	0.872**
		Sig. (2-tailed)	0.001	.	0.000
		N	1885	1890	1890
	Work Exp.	Correlation Coefficient	0.073**	0.872**	1.000
		Sig. (2-tailed)	0.002	0.000	.
		N	1885	1890	1890

Table 4 Differences between knowledge, attitude, practice scores, and gender

Tests	Knowledge	Attitude	Practice	Total Number
Mann-Whitney U	164044.500	164183.000	164221.000	159694.500
Wilcoxon W	1587872.500	1593078.000	1593116.000	1583522.500
Z	−0.414	−0.673	−0.657	-1.010
Asymp. Sig. (2-tailed)	0.679	0.501	0.511	0.312

Table 5 The relationship between the average scores of knowledges, attitude, and practice with educational levels

	Knowledge	Attitude	Practice	Total number
Kruskal-Wallis H	12.320	14.005	16.426	7.385
df	5	5	5	5
Asymp. Sig.	0.031	0.016	0.006	0.194

($r=0.073$, $p=0$ 0.002). These correlations suggest that both age and work experience are positively associated with higher KAP scores among HCWs. However, the correlation coefficients are relatively low, indicating that other factors may also contribute to variations in KAP scores.

Table 4 indicates that there are no statistically significant differences in Knowledge, Attitude, and Practice scores between male and female HCWs, as all *p*-values are greater than the conventional significance level of 0.05.

Table 5 indicates that there are statistically significant differences in the average scores of Knowledge, Attitude, and Practice across different educational levels, as the *p*-values for these categories are less than the conventional significance level of 0.05. Specifically, Knowledge: $p=0.031$, Attitude: $p=0.016$, and Practice: $p=0.006$. However, the total number does not show a statistically significant difference ($p=0.194$), suggesting that the educational level does not significantly impact the total number of participants in each educational category. The details of Spearman's rank correlation coefficient are shown in Fig. 1.

The map identifies the provinces where the KAP of IM strategies are superior (Lorestan, Kohgiluyeh Boyer-Ahmad, and Semnan) and where they are inferior (Qom, Alborz, West Azerbaijan (Urmia), and Fars). This indeed underscores the regional disparities in IM during critical periods such as pandemics (Fig. 2).

Discussion

We employed a cross-sectional survey design with a large and diverse sample of 1890 Iranian healthcare workers (HCWs) to investigate their knowledge, attitudes, and practices (KAP) regarding infodemic management (IM). As disease literacy (knowledge) and attitude are known to influence preventive measures during outbreaks [17]
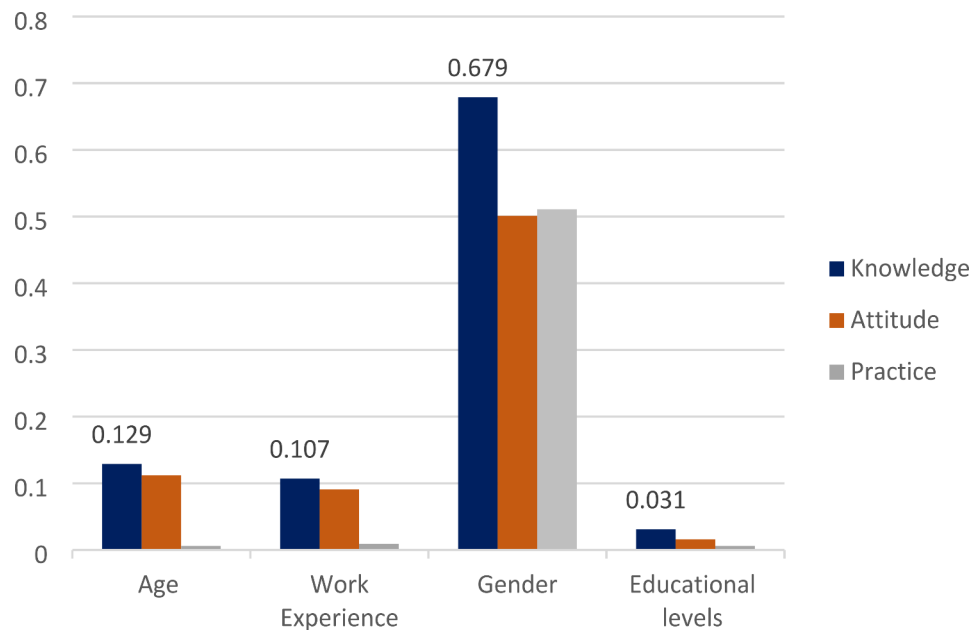
Fig. 1 The correlations between criteria and KAP

this study aimed to assess HCWs' cognitive initial constructs (KAP) for IM. Our findings revealed positive correlations between age, work experience, and KAP scores, suggesting knowledge and skills development over time. However, practice scores did not correlate significantly with age or experience. Additionally, while gender did not show a significant impact, educational level displayed a statistically significant association with KAP scores.

Our study revealed significant positive correlations between age and both knowledge, indicating that older healthcare workers (HCWs) tend to score higher on knowledge and attitude assessments related to infodemic management (IM). This finding aligns with existing literature, suggesting that older HCWs are better at managing rumors in public health emergencies [18, 19]. The interrelation of aging, knowledge, and cognitive performance provides further insights into the relationship between age and knowledge [20]. Research consistently shows that as HCWs age and gain more experience, their knowledge and skills improve. A study on healthcare-associated infections (HAIs) among HCWs in Wuhan, China, found that job-related factors, including clinical experience, significantly influenced knowledge and practice related to HAIs [21]. This supports the idea that more experienced HCWs are likely to have better knowledge and practices. Another study emphasized that continuous education and training significantly enhance HCWs' knowledge and attitudes toward managing misinformation and disinformation during health crises [22]. This is consistent with the finding that educational level is significantly associated with KAP scores. Studies focusing on public health professionals' responses to misinformation highlight that

older and more experienced HCWs tend to have a deeper understanding and more robust skills in managing health information [21, 22]. This underscores the critical role of experience in developing effective infodemic management strategies.

Our study also found positive correlations between work experience and knowledge (rho=0.107, $p<0.05$) and attitude scores (rho=0.091, $p<0.05$). Similar to age, HCWs with more experience tended to have higher knowledge and attitude scores. According to Purnat et al. (2023), managing infodemics requires leveraging past outbreak experiences and ongoing training to enhance HCWs' knowledge and attitudes [23]. During emergencies, healthcare providers may struggle to access accurate information, and their decision-making can be influenced by past experiences, trust in authorities, and social circles [24]. Our findings are further supported by other studies acknowledging the positive link between experience and knowledge/attitude, emphasizing the value of lifelong learning for HCWs [18, 20]. This is crucial for managing infodemics and developing a skilled healthcare workforce.

Interestingly, our study found a weak negative correlation between practice scores and age, and a weak positive correlation between practice scores and work experience, both of which were not statistically significant. This suggests that neither age nor work experience significantly impacts practice scores among healthcare workers (HCWs). One study found that the practice of HCWs regarding personal protective equipment in COVID-19 varied significantly based on several factors, including age and work experience [24]. Specifically, younger
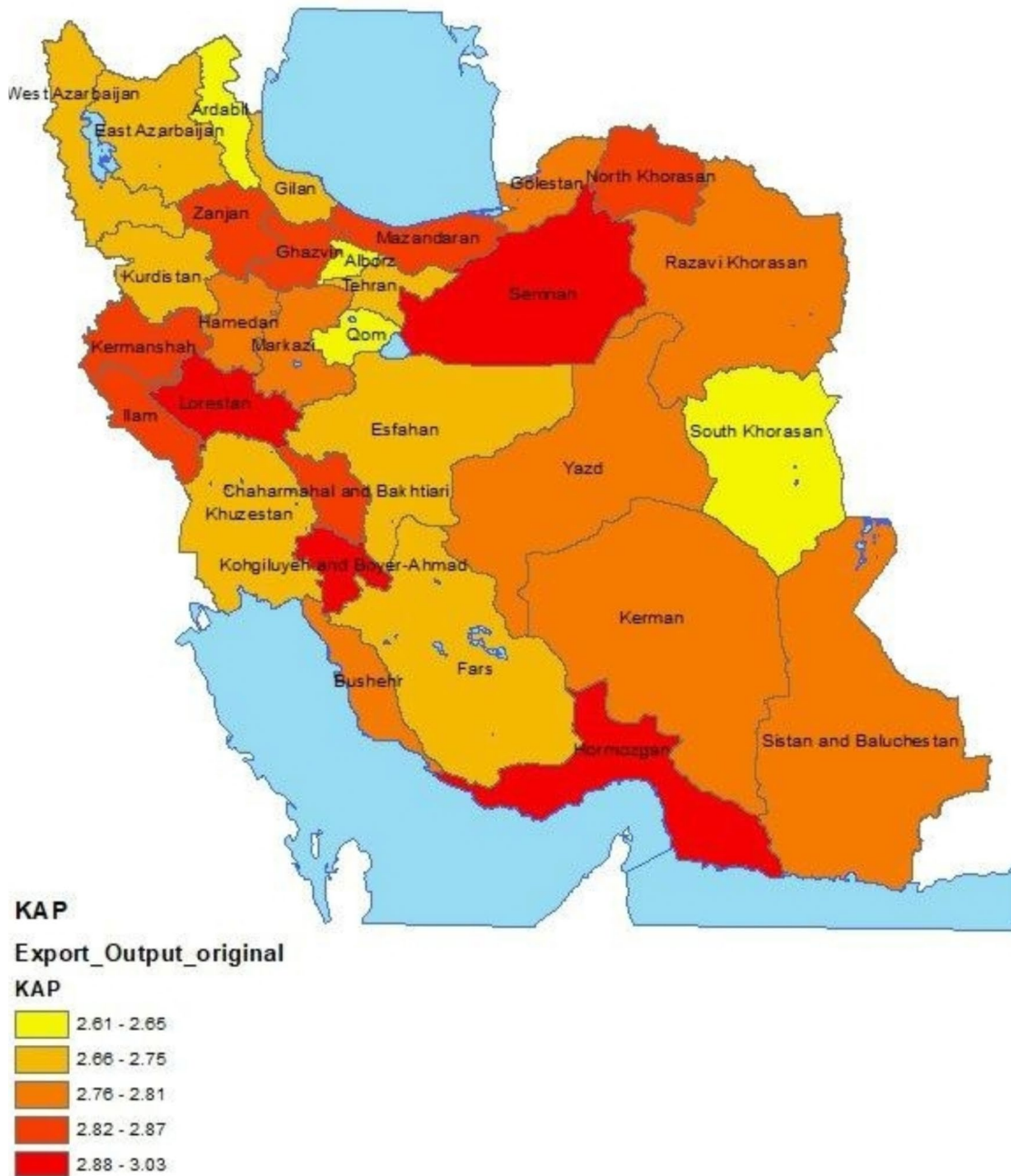
Fig. 2 The total average of KAPIM in Iran's provinces

healthcare workers and those with less work experience sometimes exhibited better practice scores, which might seem counterintuitive but aligns with our finding of a weak correlation between practice scores and age/work experience [24]. These studies suggest that while knowledge and skills may improve with age and experience, actual practice behaviors are influenced by a complex interplay of factors, including workplace environment, specific job roles, and individual perceptions and attitudes toward guidelines and training. This highlights a potential disconnect between knowledge and attitude, and the actual implementation of best practices. Several factors might contribute to this gap, including time constraints and workload pressures in healthcare settings, lack of localized guidelines or protocols for implementing infodemic management strategies, and insufficient resources or support systems within healthcare institutions. Future research should explore these potential barriers and identify strategies to bridge the knowledge-practice gap. Developing practical tools and resources to support HCWs in implementing best practices could be highly beneficial.

Our study found no significant influence of gender on KAP scores related to infodemic management (IM), indicating that gender does not appear to be a significant factor influencing these scores among the study participants. This suggests that IM training and resources are reaching healthcare workers (HCWs) of all genders effectively, promoting equitable access to knowledge and a unified approach to managing information flow within healthcare settings. This finding is supported by various studies in the healthcare sector, which consistently show that gender does not play a significant role in determining the knowledge, attitudes, and practices of healthcare workers in several contexts, including infection prevention and control measures [25]. Similarly, research on healthcare-associated infections (HAIs) among healthcare workers in Wuhan, China, indicated that gender did not significantly influence knowledge or practices related to HAI prevention and control [21]. These findings align with our study's result, suggesting that infodemic management training and resources are being accessed equitably across genders, promoting a unified approach to managing information flow within healthcare settings. This is a positive indication that educational interventions are effectively reaching healthcare workers of all genders, supporting our conclusion of equitable access to IM knowledge and practices. In contrast, some studies have found gender differences in knowledge about specific health issues. For instance, studies in South Korea [26, 27], China [28], and Hong Kong [29] revealed that males had less knowledge about COVID-19, rendering them particularly vulnerable to the epidemic [21, 22] However, these differences may be context-specific

and not necessarily indicative of a broader trend across all healthcare contexts. Overall, the absence of significant gender differences in KAP scores in our study suggests that current IM training programs are effectively addressing the needs of all HCWs, regardless of gender, which is crucial for fostering a well-informed and cohesive healthcare workforce.

Our study found a statistically significant association between educational level and KAP scores among healthcare workers (HCWs), with higher educational levels correlating with better knowledge and attitudes towards infodemic management (IM). This suggests that more educated HCWs are better equipped with a strong foundation for understanding IM principles and developing positive attitudes toward their importance. Research supports our findings. For instance, studies have shown that educational interventions significantly enhance HCWs' knowledge and attitudes toward managing misinformation and disinformation during health crises [30]. Wong et al. (2022), Zhang et al. (2019), and Gao et al. (2020) also reported positive correlations between education and knowledge scores, indicating that less educated individuals are more vulnerable during epidemics like COVID-19 due to their lower knowledge levels [26, 28, 29]. This aligns with our results, where higher educational levels are associated with better knowledge and attitudes [30]. However, the lack of a significant difference in total KAP scores suggests that variations within each educational group may even out the overall picture. This could indicate that while education improves specific aspects of knowledge and attitudes, other factors might influence the total KAP scores. For instance, workplace environment, specific job roles, and individual perceptions and attitudes towards guidelines and training might also play significant roles in shaping overall KAP scores. Further investigation into the specific knowledge and skills gained at different educational levels could provide deeper insights. Identifying the areas where educational interventions are most effective can help in developing targeted training programs to enhance IM capabilities across all educational levels [30]. By understanding the nuanced impacts of education on KAP scores, we can better design educational programs that address the specific needs of HCWs, ensuring that all receive the necessary training to manage infodemics effectively. This approach supports the development of a skilled workforce capable of handling health information crises proficiently.

The KAP scores of infodemic management were found to be superior in the provinces of Lorestan, Kohgiluyeh Boyer-Ahmad, and Semnan. Conversely, these aspects were observed to be inferior in the provinces of Qom, Alborz, West Azerbaijan (Urmia), and Fars. These

findings suggest regional disparities in infodemic management during critical periods such as pandemics.

Limitations and counterstrategies

This study employed a cross-sectional design, capturing a snapshot of healthcare workers' (HCWs) knowledge, attitude, and practice (KAP) regarding infodemic management in Iran at a specific point in time. While this design provides valuable insights, it cannot establish causal relationships. The online data collection method, though efficient and accessible, may have introduced selection bias towards individuals with internet access and familiarity with online platforms. Additionally, the reliance on self-reported data may have led to biases, and the sample had a predominance of female participants. Despite these limitations, the study offers significant insights into HCWs' KAP, which can guide future educational interventions and policy development.

Implications and future research

The findings from this study highlight the need for targeted training programs tailored to the specific needs of different HCW groups, focusing on both knowledge acquisition and practical skill development. The identified regional variations underscore the necessity for geographically specific interventions to enhance infodemic management preparedness across Iran. Future research should explore the reasons behind the disconnect between knowledge, attitude, and practice scores. Investigating the specific factors influencing the implementation of infodemic management practices and conducting longitudinal studies to track changes in KAP over time would be valuable. Additionally, addressing the limitations of convenience sampling by using systematic sampling methods in future studies will provide a more representative sample and a clearer understanding of regional differences in infodemic management.

Conclusion

This study investigated the KAP of Iranian HCWs regarding infodemic management, revealing significant regional variations. These findings indicate the need for geographically targeted interventions to address knowledge gaps and strengthen preparedness in lower-scoring regions. The study also found positive correlations between KAP scores and factors such as age, work experience, and education, suggesting that HCWs with more experience and higher education levels may demonstrate better infodemic management capabilities. However, it is essential to note that older HCWs, with potentially more experiences, also play a crucial role. This was vice versa of the common belief that the younger generation have better digital literacy and medica literacy would be the better infodemic manager. Effective infodemic management requires a combination of strong foundational knowledge, practical skills, and the ability to leverage digital platforms to combat misinformation.

Declarations

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