

Knowledge, Attitude and Practice toward COVID-19 among Iraqi Adults in Karbala

Saad Ibrahim Al-Ghabban*

Department of Family and Community Medicine, College of Medicine, University of Al-Ameed, Karbala, Iraq.

*Correspondence to: Saad Ibrahim Al-Ghabban (E-mail: saad_alghabban@alameed.edu.iq)

(Submitted: 12 August 2022 – Revised version received: 28 August 2022 – Accepted: 15 September 2022 – Published online: 26 December 2022)

Abstract

Objectives: To assess the knowledge, attitude and practice scores regarding COVID-19 in relation to sociodemographic states among the Iraqi adults in Karbala.

Methods: This cross-sectional population based interview survey involved 425 Iraqi adult population in Karbala, Iraq between December 2021 and February 2022 using a cluster sampling technique. Closed-ended questionnaire regarding the sociodemographic variables and questions about the knowledge, attitude and practice towards COVID-19. The data were analysed using SPSS software (version 25). The mean scores were calculated, and Independent-samples *t* test, one-way analysis of variance (ANOVA), or Chi-square test (χ^2) were used to test for differences.

Results: The mean knowledge, attitude, and practice scores were 80.67%, 54.35%, and 50.83% % of total achievable scores respectively. Females showed significantly higher knowledge attitude, and practice mean scores than males. Higher mean score of attitude was found among 18–25 years of age among those with bachelor's degree. The unmarried showed higher scores of attitude, and practice than married. Students showed higher attitude score than other occupational groups.

Conclusion: Karbala adult population have high knowledge, negative attitude and weak practice in the precautionary measures about COVID-19, with an uneven distribution of behavioral patterns among socio-demographic subgroups. Further research targeting the vulnerable people is recommended so that the health education and communication interventions be ensured according to their needs.

Keywords: Knowledge, attitude, practice, COVID-19, Karbala

Introduction

Coronavirus disease 2019 (COVID-19) is an acute infectious respiratory disease that is caused by the SARS-CoV-2 virus, characterized by common symptoms of fever, cough, tiredness, and loss of taste or smell.^{1,2} The World Health Organization (WHO) declared it as a worldwide pandemic on 11 March 2020, and stated that good knowledge about its methods of spread, social distancing, wearing mask, hand washing, and vaccination are the best methods of prevention.¹ In addition, it was concluded that the morbidity and mortality rates could be dramatically decreased by highlighting those individual precautionary behaviors among the public,^{3,4} which should become a routine practice in order to attain the required goals.⁵

Knowledge, attitudes, and practices (KAP) towards COVID-19 affect the people's adherence to preventive and control measures.⁶ Several KAP studies concluded that attitude and practice of preventive behaviors are positively associated with the level of knowledge,⁷⁻¹¹ and many studies identified gaps in knowledge and an uneven distribution of behavioral patterns among socio-demographic subgroups.^{8,12} Those variations would be a field-based evidence for the policymakers in to help them in the epidemic management and predicting factors for adherence to education information to implement effective public health interventions. Therefore, there is a need to identify the vulnerable people so that the health education and communication interventions be ensured according to their needs.

Many studies addressed the behavioral factors and related vulnerability during the COVID-19 pandemic.^{5,13-19} Few studies in Iraq and Asian countries^{5,17,20,21} were conducted the interview, the others were online studies. Many of those

studies showed that most Iraqis, like people of neighborhood countries showed an average or adequate awareness about COVID-19 and the majority of the participants claimed practicing the non-interventional precautionary measures.²²⁻²⁵

The success of the preventive and control measures of any disease depends on the adherence of the peoples to those measures, which is influenced by their KAP towards the disease and the factors affecting them. COVID-19 is not an exception therefore; public's awareness of COVID-19 is needed to facilitate the epidemic management. The objective of this study was to assess the level of KAP regarding COVID-19 in relation to sociodemographic states among the Iraqi adults in Karbala.

Subjects & Methods

Study Design and Setting

This cross-sectional population based interview survey involved 425 Iraqi adult population ≥ 18 years of both genders living in Karbala Governorate in Iraq. Periods of recruitment and data collection was from 10 December 2021 to 15 February 2022.

After minor modification and Arabic translation, the closed-ended questionnaire developed by Zhong et al. and adopted by Lee, Kang et al. was used for this study.^{5,6} The questionnaire consisted of two parts. The first part comprises the sociodemographic variables including gender, age, education, marital status, monthly household income, current residence, and occupation, and place of current residence. The second part included 15 KAP questions. Six items regarding knowledge about clinical presentation, modes of transmission, preventive measures and effectiveness of treatment, rated on a

3-point Likert scale. Five questions about attitude including two items regarding attitude about perceived risk and severity of the disease if attracted, and three items regarding efficacy beliefs of the precautionary behaviors, rated on a 5-point Likert scale. In addition, four questions about preventive practices rated on a 4-point Likert scale. The questionnaire was reviewed and validated by five members of the teaching staff in the college.

Ethical Consideration

The Institutional Review Board Research Ethics Committee of the College of Medicine at University of Al-Ameed reviewed and approved the study protocol at 23 October 2021.

To ensure the applicability of the questionnaire and to have an idea about the average time needed to fill it, a pilot study was done on 30 adults from Karbala city center. Minor modification in the questionnaire was done accordingly. The reliability of the questionnaire was calculated (Cronbach alpha coefficients for the knowledge, attitude and the practice scales were 0.71, 0.79, and 0.72 respectively). The pilot study results were not included in the final analysis.

Sampling Methods and Data Collection

A cluster sampling technique was used. Twenty well-trained fourth year medical students living in the different areas in Karbala were selected for collection of data from Iraqi adults living in five neighborhood houses.

Cochran's sample size formula was used to yield a representative sample size^{26,27}. A proportion (p) of 50% was assumed, and a confidence level of 95% and an error margin (e) of 5% was used to calculate the sample size (n_0) using the equation

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where, $Z = Z$ score, $q = p - 1$

The calculated sample size was 384. A 15% increase was added to compensate for the probable non-responses, and to increase the study power. Therefore, 440 were eligible to participate.

Face-to-face interview was used to gather the information from participants with maintaining proper precaution and spatial distancing. After introducing themselves and explaining the aim of the study and the voluntary anonymous and confidential nature of participation, the interviewers invited the participants to participate and oral informed consents were obtained from them. The time needed for the completion of the questionnaire was on an average of 15 min.

All Iraqi individuals 18 years and older of both genders who agreed to participate in the study were interviewed. Family members of the interviewers were not included.

For scoring, 0–2 points were assigned to the responses on the knowledge items (do not know no, and yes respectively), with a knowledge score of up to 12. On the attitude items regarding perceived risk and severity 0–4 points were assigned to the responses (none or very low, low, neither low nor high, high and very high respectively), and on attitude items regarding efficacy beliefs of the precautionary behaviors 0–4 points were assigned to the responses (not at all, little, median, high, and extremely high respectively). The total attitude score was up to 20. On practice items 0–3 points were assigned to the responses, (not at all, little, median, high, and extremely high respectively & the number of the vaccine doses taken). The practice score was up to 12.

In order to calculate the item-scoring percentages for KAP, the actual score of an item is divided by the total achievable score and multiplied by 100%. And as considered in a previous KAP studies, high knowledge, positive attitude, and good practice were considered if participant answered $\geq 75\%$ of the questions correctly, moderate knowledge, neutral attitude, and acceptable practice if they answered 60–74% of the questions correctly, and low knowledge, negative attitude, and weak practice if they answered $< 60\%$ of the questions correctly.^{28,29}

Statistical Analysis

The statistical analysis was conducted using the SPSS software (version 25). The mean KAP scores were described as the mean \pm standard deviation (SD) and the categorical variables were presented as frequencies with percentages. Independent-samples t test, one-way analysis of variance (ANOVA), or Chi-square test (X^2) were used to compare the KAP scores of groups with different sociodemographic characteristics as appropriate. Pearson's correlation analysis was carried out to examine relationships among KAP scores, and linear regression analysis was used to identify factors associated with KAP scores. A P -value < 0.05 was considered as statistically significant.

Results

Of the total 440 eligible members, fifteen members do not agree to participate because of their old age and/or being bed-ridden, (response rate 96.6%). Of the 425 participants included in the study, and analysed 211 were males (49.6%) and 214 were females (50.4%), about two thirds (66.4%) were within the age group 18–25 years ($n = 282$), the mean age was 28.5 ± 12.7 years. The majority (81.9%) were residents of urban regions ($n = 384$), most of them (65.2%) were unmarried ($n = 277$), and 58.2% had an educational degree above secondary school ($n = 247$). more than half (58.6%) were students, and 51.2% had a family monthly income \leq one million ID, ($n = .218$). No missing data for all the variables could be found probably because it was an interview survey done by well-trained medical students.

The mean knowledge score was 9.68 ± 2.025 (range 2–12) showing 80.67% % of total achievable score indicating good Knowledge. The mean attitude score was 10.87 ± 3.006 (range 1–19) showing 54.35% % of total achievable score indicating negative attitude. The mean practice score was 6.10 ± 2.295 (range 0–12) showing 50.83% % of total achievable score indicating weak practice. The mean KAP scores of the participants according to their socio-demographic characteristics are shown in Table 1.

Females showed significantly higher mean KAP scores than males. Higher mean attitude score was found among 18–25 years of age, students, those with bachelor's degree, and among unmarried with no significant difference in that of knowledge and practice. The unmarried showed higher scores of practice. No significant difference in all the score among members with different monthly household income and between those from urban and rural residence.

Multiple linear regression analysis identified that there was a relationship between the KAP scores and the gender, education, and marital status of the participants, $F = 2.272$, $P = 0.028$; $F = 5.795$, $P < 0.001$; and $F = 3.009$, $P = 0.004$ respectively. (Table 2) those variables were responsible for 3.7%,

Table 1. Relation between sociodemographic variables and KAP scores

Variables	Subgroup	Number (%)	Knowledge		Attitude		Practices	
			Mean score/ 12 (SD)	P-value	Mean score/ 20 (SD)	P-value	Mean score/ 12 (SD)	P-value
Gender	Male	211 (49.6%)	9.34 (2.177)	.001	10.53 (3.344)	.018	5.82 (2.362)	.011
	Female	214 (50.4%)	10.01 (1.808)		11.21 (2.593)		6.38 (2.198)	
Age group	<25	282 (66.4%)	9.57 (2.09)	.291	11.27 (3.09)	.001	6.24 (2.326)	.063
	25–49	109 (25.6%)	9.92 (1.98)		10.13 (2.59)		5.66 (2.212)	
	≥50	34 (8.0%)	9.79 (1.51)		9.97 (2.89)		6.35 (2.173)	
Education	Illiterate	29 (6.8%)	9.10 (2.093)	.476	10.86 (3.159)	.000	5.41 (2.639)	.404
	Elementary School	48 (11.3%)	9.56 (2.103)		9.19 (3.462)		5.77 (2.045)	
	Secondary School	101 (23.8%)	9.90 (1.993)		10.89 (2.856)		6.27 (2.588)	
	Diploma Degree	36 (8.5%)	9.39 (2.346)		10.19 (3.927)		5.92 (2.116)	
	Bachelor's Degree	200 (47.1%)	9.72 (1.998)		11.46 (2.587)		6.22 (2.178)	
Marital status	Post Graduate Degree	11 (2.6%)	9.73 (.786)	.785	9.64 (2.501)	.000	6.45 (2.115)	.014
	Unmarried	277 (65.2%)	9.63 (2.081)		11.42 (2.939)		6.33 (2.318)	
	Married	132 (31.1%)	9.75 (1.936)		9.92 (2.839)		5.73 (2.162)	
Household income (ID)	Divorced/ Widowed	16 (3.8%)	9.88 (1.857)	.785	9.25 (3.109)	.103	5.25 (2.490)	.582
	≤0.5 Million	92 (21.6%)	9.62 (1.999)		10.97 (3.273)		5.86 (2.299)	
	>0.5 to 1 Million	126 (29.6%)	9.75 (1.820)		10.33 (2.828)		6.10 (2.172)	
	>1–1.5 Million	113 (26.6%)	9.54 (2.315)		11.09 (3.104)		6.31 (2.228)	
Place of residence	>1.5 Million	94 (22.1%)	9.80 (1.960)	.756	11.24 (2.785)	.471	6.10 (2.532)	.548
	Urban	348 (81.9%)	9.69 (1.999)		10.92 (2.953)		6.14 (2.264)	
Occupation	Rural	77 (18.1%)	9.61 (2.153)	.582	10.65 (3.248)	.001	5.96 (2.441)	.206
	Unemployed	71 (16.7%)	9.76 (1.760)		10.28 (3.498)		5.72 (2.421)	
	Student	249 (58.6%)	9.64 (2.071)		11.37 (2.815)		6.24 (2.352)	
Total	Private Worker	44 (10.4%)	9.39 (1.991)	.001	10.02 (3.253)	.001	5.70 (2.119)	.206
	Employed/Retired	61 (14.4%)	9.92 (2.163)		10.16 (2.602)		6.28 (1.976)	
Total		425 (100.0%)	9.68 (2.025)		10.87 (3.006)		6.10 (2.295)	

Table 2. Regression analysis of KAP with Socio-demographic characteristics of participants

KAP item	Socio-demographic variable	R	R Square	F	Sig.	Beta	t	Sig.
Knowledge	Gender					.700	3.510	.000
	Age group					.304	1.497	.135
	Education					.076	.915	.361
	Marital status	.192	.037	2.272	.028	-.080	-.350	.726
	Monthly household income					.042	.434	.665
	Place of residence					-.025	-.098	.922
	Occupation					.035	.287	.774
Attitude	Gender					.713	2.480	.014
	Age group					.039	.133	.894
	Education					.218	1.813	.071
	Marital status	.298	.089	5.795	.000	-1.213	-3.670	.000
	Monthly household income					.058	.417	.677
	Place of residence					-.124	-.336	.737
	Occupation					-.183	-1.050	.295
Practice	Gender					.675	3.007	.003
	Age group					.286	1.250	.212
	Education					.035	.368	.713
	Marital status	.219	.048	3.009	.004	-.816	-3.165	.002
	Monthly household income					.069	.635	.526
	Place of residence					-.093	-.325	.746
	Occupation					.173	1.270	.205

8.5%, and 4.8% of the knowledge, attitude, and practice scores respectively ($r^2 = 0.037, 0.089, \text{ and } 0.048$ respectively).

There was a significant correlations between Knowledge and attitude scores $r = 0.125$ ($P < 0.01$), between knowledge and practice scores $r = 0.163$ ($P < 0.001$), and between attitude and practice score, $r = 0.231$ ($P < 0.0001$).

The main clinical symptoms of COVID-19 were known by 88.2% of the participants (K1), and only 30.1% knew that not all persons with COVID-2019 will develop severe cases (K3). The most frequent positive attitude (20%) was toward the effectiveness of social distancing in reducing the risk of COVID-19 (A4), and most frequent negative attitude (15.8%) was toward the possibility of COVID-19 infection if the person does not follow the precautionary measures (A1). The most frequent appropriate practice (32.5%) was hand washing (P2) and most frequent weak one (27.3%) was not taking the vaccine (P4). The details of the participants' responses towards the KAP items is demonstrated in Table 3 and the distribution of the KAP levels according to the sociodemographic variables is shown in Table 4.

Discussion

The results of this interview study indicated that the respondents have high knowledge about COVID-19, including the main clinical symptoms, the benefit of early symptomatic and supportive treatment in helping most patients to recover, the transmission through respiratory droplets, and the role of medical masks in prevention of infection by the COVID-19 virus. Similar results, apart from the last item were obtained in a previous study in China.⁵

Honarvar, Lankarani et al. 2020 concluded similar result concerning masks but participants had low knowledge about the common symptoms.²⁰

In spite of the high knowledge, the respondents have negative attitude and weak practice levels. More than half of the respondents believe that the possibility of acquiring the infection if they do not follow the precautionary measures and the perceived severity of the disease are very low or low and most respondents don't comply with the recommended practices of wearing masks and avoiding visiting crowded places. Unsatisfactory performance of the participants in wearing masks was also concluded in face-to-face interview survey in Hong Kong,⁵ and in an online survey, in Taiwan.³⁰ According to the scores considered in this study, the respondents in Honarvar, Lankarani et al. 2020 in Iran have had similar results of negative attitude,²⁰ but appropriate practice of avoiding visiting crowded places.²⁰ In an online study among Middle East population Iraqi participants showed good participation in precautionary measures,²³ Another online studies in Iraq demonstrated high levels of knowledge and practice, with variable attitudes.^{18,31} In an interview study in the Kurdistan region, Iraq, good knowledge, positive attitudes, and proper practices regarding COVID-19 among the participants were concluded.¹⁷

Studies conducted in neighborhood countries showed variable KAP levels among residents. Syrians showed modest knowledge, attitudes and practices towards COVID-19,²⁵ Saudis, Lebanese and Sudanese demonstrated good KAP levels^{24,31,32} appropriate attitude and low level of practice among Iranians.²¹ These results are quite different from those concluded in studies done elsewhere. Good KAP scores were

Table 3. Participants' responses towards the KAP items

Responses to knowledge items						
No.	Knowledge Items (K) Is the following fact correct?	Response				
		False N (%)	Don't know N (%)	True N (%)		
K1	"The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and myalgia"	31 (7.3%)	19 (4.5%)	375 (88.2%)		
K2	"Early symptomatic and supportive treatment can help most patients to recover from infection"	30 (7.1%)	48 (11.3%)	347 (81.6%)		
K3	"Not all persons with COVID-2019 will develop severe cases"	128 (30.1%)	54 (12.7%)	243 (57.2%)		
K4	"The covid-19 virus spreads via respiratory droplets of infected individuals"	27 (6.4%)	53 (12.5%)	345 (81.2%)		
K5	"The person can wear medical masks to prevent infection by the COVID-19 virus"	48 (11.3%)	15 (3.5%)	362 (85.2%)		
K6	"There are vaccines to prevent infection with the Corona virus 19"	110 (25.9%)	51 (12.0%)	264 (62.1%)		
Responses to attitude items						
Attitude item (A)		Response				
		Very low N (%)	Low N (%)	Neither low nor high N (%)	High N (%)	Very high N (%)
A1	What do you think is the possibility of your COVID-19 infection if you do not follow the precautionary measures?	67 (15.8%)	94 (22.1%)	206 (48.5%)	48 (11.3%)	10 (2.4%)
A2	What do you think will be the severity if COVID-19 infects you?	58 (13.6%)	95 (22.4%)	197 (46.4%)	59 (13.9%)	16 (3.8%)
A3	To what extent do you think that practicing personal hygiene such as wearing facial masks and hand hygiene is an effective way to reduce the risk of COVID-19 infection.	21 (4.9%)	56 (13.2%)	141 (33.2%)	141 (33.2%)	66 (15.5%)
A4	To what extent do you think that social distancing such as avoiding crowded places is an effective way to reduce the risk of COVID-19 infection?	11 (2.6%)	47 (11.1%)	136 (32.0%)	146 (34.4%)	85 (20.0%)
A5	To what extent do you think that vaccination is an effective way to reduce the risk of COVID-19 infection?	17 (4.0%)	37 (8.7%)	144 (33.9%)	154 (36.2%)	73 (17.2%)
Responses to practice items						
Practice item (P)		Response				
		Never N (%)	Sometime N (%)	Often N (%)	Always N (%)	
P1	In the last week, how often did you practice wearing facial masks	93 (21.9%)	138 (32.5%)	106 (24.9%)	88 (20.7%)	
P2	In the last week, how often did you practice wash hands frequently and use hand sanitizer	29 (6.8%)	107 (25.2%)	151 (35.5%)	138 (32.5%)	
P3	In the last week, how often did you practice avoid visiting crowded places	74 (17.4%)	165 (38.8%)	122 (28.7%)	64 (15.1%)	
P4	How many doses of vaccine did you take?	None 116 (27.3%)	1 dose 71 (16.7%)	2 doses 229 (53.9%)	3 doses 9 (20.1%)	

found in South Korea and Philippine,^{5,9} and Wong, Chen et al. 2020 in Hong Kong reported low knowledge level and positive attitudes,³³ this might be attributed partly because most of those studies are web-based and partly to the variable cultures between those countries.

The positive association between knowledge scores and both attitude and practice scores found in this study are in

accordance with the results concluded in previous studies.^{5-11,15,19,4} These findings point out to the importance of concentrating on health education in enhancing the attitude and practice of public preventive behavior for the prevention and control of the epidemic.

The variable relationship between KAP scores and sociodemographic characteristics identified in this study was reported

Table 4. Relation between sociodemographic variables and KAP levels

Variables	Knowledge				Attitude				Practices			P-value
	Low	Moderate	High	P-value	Negative	Neutral	Positive	P-value	Weak	Acceptable	Good	
Gender												
Male	40 19.0%	50 23.7%	121 57.3%	.005	151 71.6%	55 26.1%	5 2.4%	.164	163 77.3%	34 16.1%	14 6.6%	.070
Female	20 9.3%	43 20.1%	151 70.6%		146 68.2%	55 25.7%	13 6.1%		145 67.8%	53 24.8%	16 7.5%	
Age group												
< 25	44 15.6%	60 21.3%	178 63.1%		178 63.1%	88 31.2%	16 5.7%		194 68.8%	64 22.7%	24 8.5%	
25-49	14 12.8%	21 19.3%	74 67.9%	...213	90 82.6%	18 16.5%	1 0.9%	.001	87 79.8%	19 17.4%	3 2.8%	.097
≥ 50	2 5.9%	12 35.3%	20 58.8%		29 85.3%	4 11.8%	1 2.9%		27 79.4%	4 11.8%	3 8.8%	
Education												
Illiterate	8 27.6%	7 24.1%	14 48.3%		21 72.4%	6 20.7%	2 6.9%		22 75.9%	5 17.2%	2 6.9%	
Elementary School	8 16.7%	9 18.8%	31 64.6%		40 83.3%	8 16.7%	0 0.0%		39 81.3%	7 14.6%	2 4.2%	
Secondary School	13 12.9%	17 16.8%	71 70.3%	.226	73 72.3%	24 23.8%	4 4.0%	.155	68 67.3%	20 19.8%	13 12.9%	.329
Diploma Degree	6 16.7%	12 33.3%	18 50.0%		26 72.2%	7 19.4%	3 8.3%		29 80.6%	7 19.4%	0 0.0%	
Bachelor's Degree	25 12.5%	45 22.5%	130 65.0%		127 63.5%	64 32.0%	9 4.5%		143 71.5%	45 22.5%	12 6.0%	
Postgraduate Degree	0 0.0%	3 27.3%	8 72.7%		10 90.9%	1 9.1%	0 0.0%		7 63.6%	3 27.3%	1 9.1%	

(Continued)

Table 4. Relation between sociodemographic variables and KAP levels—Continued

Variables	Knowledge				Attitude				Practices			
	Low	Moderate	High	P-value	Negative	Neutral	Positive	P-value	Weak	Acceptable	Good	P-value
Marital status												
Unmarried	42 15.2%	57 20.6%	178 64.3%		173 62.5%	87 31.4%	17 6.1%		186 67.1%	67 24.2%	24 8.7%	
Married	17 12.9%	32 24.2%	83 62.9%	.779	110 83.3%	21 15.9%	1 0.8%	.000	109 82.6%	18 13.6%	5 3.8%	.021
Divorced/Widowed	1 6.3%	4 25.0%	11 68.8%		14 87.5%	2 12.5%	0 0.0%		13 81.3%	2 12.5%	1 6.3%	
Household income (ID)												
≤0.5 million	17 18.5%	14 15.2%	61 66.3%		65 70.7%	21 22.8%	6 6.5%		71 77.2%	17 18.5%	4 4.3%	
>0.5 to 1 million	13 10.3%	36 28.6%	77 61.1%	.195	96 76.2%	29 23.0%	1 0.8%	.022	90 71.4%	29 23.0%	7 5.6%	.645
>1–1.5 million	19 16.8%	24 21.2%	70 61.9%		77 68.1%	27 23.9%	9 8.0%		81 71.7%	23 20.4%	9 8.0%	
>1.5 million	11 11.7%	19 20.2%	64 68.1%		59 62.8%	33 35.1%	2 2.1%		66 70.2%	18 19.1%	10 10.6%	
Place of residence												
Urban	46 13.2%	81 23.3%	221 63.5%	.237	248 71.3%	85 24.4%	15 4.3%		251 72.1%	72 20.7%	25 7.2%	
Rural	14 18.2%	12 15.6%	51 66.2%		49 63.6%	25 32.5%	3 3.9%	.345	57 74.0%	15 19.5%	5 6.5%	.942
Occupation												
Unemployed	7 9.9%	20 28.2%	44 62.0%		55 77.5%	12 16.9%	4 5.6%		53 74.6%	14 19.7%	4 5.6%	
Student	38 15.3%	52 20.9%	159 63.9%	.808	158 63.5%	79 31.7%	12 4.8%	.022	170 68.3%	58 23.3%	21 8.4%	.174
Private Worker	7 15.9%	9 20.5%	28 63.6%		34 77.3%	10 22.7%	0 0.0%		39 88.6%	3 6.8%	2 4.5%	
Employed/Retired	8 13.1%	12 19.7%	41 67.2%		50 82.0%	9 14.8%	2 3.3%		46 75.4%	12 19.7%	3 4.9%	
Total	60 14.1%	93 21.9%	272 64.0%		297 69.9%	110 25.9%	18 4.2%		308 72.5%	87 20.5%	30 7.1%	

in almost all previous studies reviewed. The higher knowledge among females was also demonstrated in other studies.^{6,19,30,34}

Females, those 18–25 years of age, the unmarried, students, and those with bachelor's degree showed more positive attitude. More positive attitude among females was also observed by some studies in Iraq,¹³ and other countries.^{1,4,6,19-21,33} Some studies that concluded that younger adults were less inclined to adopt preventive behaviors.^{13,30,35} The unmarried higher attitude than married, is consistent with the result of previous study in Iraq.¹⁹ Hussein, Naqid et al. 2020 found high KAP levels among the university students in Kurdistan region in Iraq studied,¹⁴ Taher, Abdul Lateef et al. 2020 found that Iraqi students are less frequently followed the main precautionary measures.³⁵ Higher level of attitude among those with higher education level was, as expected, also concluded by previous studies.^{15,19,21,33}

Females and the unmarried showed better practice than others. Better practice among females was also observed by some studies in Iraq,^{13,35} and other countries.^{6,20,21,33} The unmarried higher practice than married, is consistent with the result of previous studies in Iraq.^{4,17,19,25}

No significant difference in KAP levels among members with different household income, even though family economic level has been concluded as one of the factors influencing attitude.³⁴ Upper knowledge score was found among those with higher income.¹³ In addition, no difference in KAP levels was found between those from urban and rural residence, higher KAP level was found among urban than rural area in studies in Iraq and in China.^{13,34,35}

The uneven distribution of KAP among the different socio-demographic subgroups concluded in this study implies on the importance of directing the health educational programs to target the subgroups with low KAP. This result is similar to what previous studies had identified,^{5,8,12,13,15} and is in

contrast to an online study in Kurdistan Region of Iraq which concluded no such differences.¹⁹ No real important limitations in the study apart from that many visits at different times were needed to complete the data collection from all the eligible members because of being outside the home at the time of the first visit.

Conclusion

This study indicates that in spite of the high knowledge about COVID-19, Karbala adult population have negative attitude and weak practice in the precautionary measures. Therefore, it can be concluded that having adequate knowledge is essential but not enough to raise the level of involvement in precautionary behaviors, and people have to be forced to adhere to the appropriate preventative practices.

The higher knowledge among females, the higher attitude among females, those 18–25 years of age, the unmarried, students, and those with bachelor's degree, and the better practice among females and the unmarried showed better practice found in this study pointed out to the populations to prioritize the health education and communication intervention for prevention and control of this disease.

Acknowledgments

My great thanks to interviewers and the people involved in the study for their contribution and cooperation and my colleagues in the college of medicine in the university of Al-Ameed for their kind comments on the study protocol.

Conflicts of Interest

None. ■

References

1. WHO. Coronavirus disease (COVID-19) 2022 [cited 2022 31 July]. Available from: https://www.who.int/health-topics/coronavirus#tab=tab_1.
2. WHO. Coronavirus disease (COVID-19) 2022 [cited 2022 31 July]. Available from: https://www.who.int/health-topics/coronavirus#tab=tab_3.
3. Anderson RM, Heesterbeek H, Klinkenberg D, Hollingsworth TD. How will country-based mitigation measures influence the course of the COVID-19 epidemic? *Lancet*. 2020;395:931–4. [https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(20\)30567-5.pdf](https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(20)30567-5.pdf)
4. Ferguson N, Laydon D, Nedjati Gilani G, Imai N, Ainslie K, Baguelin M, et al. Report 9: Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand. Imperial College London, 2020 16 March 2020. Report No.: 9. <https://doi.org/10.25561/77482>
5. Lee M, Kang B-A, You M. Knowledge, attitudes, and practices (KAP) toward COVID-19: a cross-sectional study in South Korea. *BMC Public Health*. 2021;21:1–10. <https://doi.org/10.1186/s12889-021-10285-y>
6. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, et al. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *Int J Biol Sci*. 2020;16(10):1745–52. <https://doi.org/10.7150/ijbs.45221>
7. Tamang N, Rai P, Dhungana S, Sherchan B, Shah B, Pyakurel P, et al. COVID-19: a National Survey on perceived level of knowledge, attitude and practice among frontline healthcare Workers in Nepal. *BMC Public Health*. 2020;20:1905. <https://doi.org/10.1186/s12889-020-10025-8>
8. Papagiannis D, Malli F, Raptis DG, Papatheanasiou IV, Fradelos EC, Daniil Z, et al. Assessment of knowledge, attitudes, and practices towards new coronavirus (SARS-CoV-2) of health care professionals in Greece before the outbreak period. *Int J Environ Res Public Health*. 2020;17:4925. doi:10.3390/ijerph17144925
9. Lau LL, Hung N, Go DJ, Ferma J, Choi M, Dodd W, et al. Knowledge, attitudes and practices of COVID-19 among income-poor households in the Philippines: A cross-sectional study. *J Global Health*. 2020;10(1):011007. doi: 10.7189/jogh.10.011007
10. Alrubaiee GG, Al-Qalah TAH, Al-Awar MSA. Knowledge, attitudes, anxiety, and preventive behaviours towards COVID-19 among health care providers in Yemen: an online cross-sectional survey. *BMC Public Health*. 2020;20:1–11. <https://doi.org/10.1186/s12889-020-09644-y>
11. Afzal MS, Khan A, Qureshi UUR, Saleem S, Saqib MAN, Shabbir RMK, et al. Community-Based Assessment of Knowledge, Attitude, Practices and Risk Factors Regarding COVID-19 Among Pakistan Residents During a Recent Outbreak: A Cross-Sectional Survey. *Journal of community health*. 2021;46(3):476–86. <https://doi.org/10.1007/s10900-020-00875-z>
12. Lee LY, Lam EP, Chan CK, Chan SY, Chiu MK, Chong WH, et al. Practice and technique of using face mask amongst adults in the community: a cross-sectional descriptive study. *BMC Public Health*. 2020;20(1):948. <https://doi.org/10.1186/s12889-020-09087-5>
13. Jadoo SAA, Alhusseiny AH, Yaseen SM, Al-Samarrai MAM, Al-Rawi RA, Al-Delaimy AK, et al. Knowledge, attitude, and practice toward COVID-19 among Iraqi people: a web-based cross-sectional study. *Journal of Ideas in Health* 2020;3((Special 2)):258–65. <https://doi.org/10.47108/jidhealth.Vol3.IssSpecial%202.59>
14. Hussein NR, Naqid IA, Jacksi K, Abdi BA. Assessment of knowledge, attitudes, and practices toward COVID-19 virus among university students in Kurdistan region, Iraq: Online cross-sectional study. *Journal of Family Medicine and Primary Care*. 2020;9(9):4809–14. doi: 10.4103/jfmpc.jfmpc_870_20
15. Ali ZR, Kamali AS, Ahmed ZK, Ahmed CJ, Sharif BO, Abbas VT, et al. Community-Based Assessment of Knowledge, Attitudes, and Practices

- Towards COVID-19: an Epidemiological Survey in Kurdistan Region, Iraq. *Kurdistan Journal of Applied Research*. 2020;5(2):1–12. DOI:10.24017/science.2020.2.1
16. Basheti I, Nassar BA, Elhajji FW, Othman B, Alkouds KT, Al-Ani Z. COVID-19 and Role of Pharmacists: Knowledge and Perceptions of Pharmacists from Iraq and Syria. *Pharmacy Practice*. 20(1):2585. 2022;20(1). <https://doi.org/10.18549/PharmPract.2022.1.2585>
 17. Naqid IA, Abdi BA, Ahmed RH, Ibrahim N, Musa DH, Saleem ZS, et al. Public knowledge, attitudes, and practices regarding the coronavirus disease pandemic: a cross-sectional study in the Kurdistan region, Iraq. *European Journal of Molecular & Clinical Medicine*. 2021;8(2):1148–61.
 18. Ghazi HF, Taher TM, AbdalQader MA, Raheema RH, Baobaid MF, Hasan TN. Knowledge, Attitude, and Practice Regarding Coronavirus Disease-19: Population-Based Study in Iraq. *Open Access Macedonian Journal of Medical Sciences*. 2020;8(T1):137-41. <https://doi.org/10.3889/oamjms.2020.4965>
 19. Abas NQ, M; Abbas, N; Yusif, M; Jaff, D. Knowledge, Attitudes, and Practices on COVID-19 in Kurdistan Region of Iraq: An Online Cross-Sectional Survey. *Passer Journal*. 2022:14–24. doi:10.24271/psr.36
 20. Honarvar B, Lankarani KB, Kharmandar A, Shaygani F, Zahedroozgar M, Haghighi MRR, et al. Knowledge, attitudes, risk perceptions, and practices of adults toward COVID-19: a population and field-based study from Iran. *International Journal of Public Health* 2020;65:731–9. <https://doi.org/10.1007/s00038-020-01406-2>
 21. Araban M, Karimy M, Mesri M, Rohani M, Armoon B, Koohestani HR, et al. The COVID-19 Pandemic: Public Knowledge, Attitudes and Practices in a central of Iran. *Journal of Education and Community Health* 2021;8(1):35–40. DOI: 10.29252/jech.8.1.35
 22. Yousef B, Badi S, Hamed A, Abualama M, Mustafa M, Abdulaheem M. Knowledge, attitude, and practice of sudanese pharmacists toward COVID-19 in Khartoum State, Sudan: An online-based cross-sectional study. *Libyan International Medical University Journal*. 2021;6(1):19. DOI: 10.4103/liuj.liuj_42_20
 23. Jaber RM, Mafrachi B, Al-Ani A, Shkara M. Awareness and perception of COVID-19 among the general population: A Middle Eastern survey. *PLoS One*. 2021;16(4):e0250461. <https://doi.org/10.1371/journal.pone.0250461>
 24. Alnasser AHAA-T, J. A.; Al-Kalif, M. S. H.; Shahadah, R. F. B.; Almuqati, K. S. A.; Al-Sulaiman, B. S. A.; Alharbi, K. K. S.; Alabbad, F. Y. M.; Alabbad, J. Y. M.; Alquwaiz, I. A. I.; Almashama, I. K. I. Public Knowledge, Attitudes, and Practice towards COVID-19 Pandemic in Saudi Arabia: A Web-Based Cross-Sectional Survey. *Medical sciences*. 2021;9:1-12. <https://doi.org/10.3390/medsci9010011>
 25. Al Ahdab S. A cross-sectional survey of knowledge, attitude and practice (KAP) towards COVID-19 pandemic among the Syrian residents. *BMC Public Health*. 2021;21:296. <https://doi.org/10.1186/s12889-021-10353-3>
 26. Israel GD. Determining-Sample-Size. University of Florida IFAS Extension; 2013. <http://edis.ifas.ufl.edu>
 27. Nanjundeswaraswamy TDS. Determination of sample size and sampling methods in applied research. *Proceedings on Engineering Sciences*. 2021;3(1):25–32. doi: 10.24874/PES03.01.003
 28. Cheraghi ZO, B. Irani, A.D. Talaei, M. Ahmadnezhad, E. Gooya, M.M. Soroush, M. Asl, H.M. Holakouie-Naieni, K. Knowledge, Attitude, and Practice regarding Food, and Waterborne Outbreak after Massive Diarrhea Outbreak in Yazd Province, Iran, Summer 2013. *International Scholarly Research Notices*. 2014;2014. <http://dx.doi.org/10.1155/2014/403058>
 29. Al-Ghabban SI, Al-Ghabban WS, Abd-Oun SI, Ubaid HA. Maternal knowledge, attitude, and practice regarding diarrhoea and waterborne diseases in rural districts of Karbala, Iraq. *JPMA The Journal of the Pakistan Medical Association*. 2021;71(Suppl 9)(12):S59-s64. <https://pubmed.ncbi.nlm.nih.gov/35130250/>
 30. Luo YF, Chen LC, Yang SC, Hong S. Knowledge, Attitude, and Practice (KAP) toward COVID-19 Pandemic among the Public in Taiwan: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*. 2022;19. <https://doi.org/10.3390/ijerph19052784>
 31. Sakr S, Ghaddar A, Sheet I, Eid AH, Hamam B. Knowledge, attitude and practices related to COVID-19 among young Lebanese population. *BMC Public Health*. 2021;21(1):653–63. <https://doi.org/10.1186/s12889-021-10575-5>
 32. Abdulaheem M, Yousef B, Badi S. Knowledge, attitude, and practice of sudanese pharmacists toward COVID-19 in Khartoum State, Sudan: An online-based cross-sectional study. *Libyan International Medical University Journal*. 2021;6(1):19. DOI: 10.4103/LIUJ.LIUJ_42_20
 33. Wong CL, Chen J, Chow KM, Law BM, Chan DN, So WK, et al. Knowledge, attitudes and practices towards COVID-19 amongst ethnic minorities in Hong Kong. *Int J Environ Res Public Health*. 2020;17:7878. doi:10.3390/ijerph17217878
 34. Yang K, Liu H, Ma L, Wang S, Tian Y, Zhang F, et al. Knowledge, attitude and practice of residents in the prevention and control of COVID-19: An online questionnaire survey. *Journal of advanced nursing*. 2021;77(4):1839–55. doi: 10.1111/jan.14718
 35. Taher TMJ, Abdul Lateef AS, Abbas HZ. Community Preventive Measures Related to Coronavirus Disease-19 among Iraqi Population. *Open Access Macedonian Journal of Medical Sciences*. 2020;8(T1):325–9. <https://doi.org/10.3889/oamjms.2020.5199>

This work is licensed under a Creative Commons Attribution-NonCommercial 3.0 Unported License which allows users to read, copy, distribute and make derivative works for non-commercial purposes from the material, as long as the author of the original work is cited properly.