



Knowledge, Attitudes, and Practices on COVID-19 in Kurdistan Region of Iraq: An Online Cross-Sectional Survey

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ABSTRACT

Background: First COVID-19 case was recorded on February (26th, 2020) in Kurdistan Region of Iraq (KRI). Shortly after that number of cases increased significantly but, limited research has been conducted to assess the knowledge, attitudes, and practices of the population in the region about the pandemic.

Objectives: The objective of this study was to gain a better understanding of the people's awareness and their attitude towards the pandemic by conducting a knowledge, attitude and practice (KAP) survey.

Materials and Methods: A quantitative, descriptive, cross-sectional online survey, and non-probability, convenient sampling of 325 adults, was conducted during a complete lockdown period from (5th to 20th of April, 2020) in KRI.

Results: High levels of knowledge and practice, with divided positive and negative attitudes, were found among participants. The study found a positive relationship between knowledge and attitudes and the resulting practice.

Conclusions: Studies about the COVID-19 pandemic are very scarce in the KRI. There were no significance differences between the socio-demographic characteristics and levels of knowledge, attitudes and practices. We encourage further KAP studies in the KRI regarding COVID-19 for setting health awareness campaigns in promoting practical information on preventive measures to stop the spread of the virus accordingly.

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Keywords: Attitudes, COVID-19, Garmian Region, Knowledge, Practice, Preventive Measures.

1. Introduction

In December (2019), coronavirus disease (COVID-19) has been first reported in Wuhan, China and began spreading rapidly through several countries [1]. On 11th of March 2020, the World Health Organization (WHO) declared COVID-19 a pandemic [2]. By mid-August 2020, total confirmed cases surpassed 21 million globally. In the Kurdistan Region of Iraq (KRI), the first diagnosis of COVID-19 cases has been in February 26th 2020. By March 1st 2021 there have been 108,954 confirmed cases (1.8%), with 103,514 (95%) recoveries and 3,519 (3.2%) fatalities out of a population over six million [3].

Infection control measures are always recommended in preventing transmission of infection in infected settings [4]. Good knowledge is crucial for controlling infection spreads by enhancing correct practices in preventing measures, and hence to ensure better safety [5]. It has been proved that the best measures for infection control are good knowledge, positive attitudes, and healthy practice6. Knowledge about COVID-19 were provided widely, and from many resources, including international resources and local resources, Ministry of Health in Kurdistan Region of Iraq (KRI) has been providing knowledge and updates about COVID-19 through a special dashboard [3].

Since the appearance of the pandemic, a number of knowledge, attitude and practice (KAP) studies have been carried out in Iraq and various regions of the KRI. Based on our knowledge, there have been three KAP studies conducted on the general population in Iraq [7, 8, 9], and one study on the population residing in the KRI

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[10]. Other similar studies in Iraq and KRI were mainly conducted among healthcare workers [11, 12, 13].

KAP studies were carried out in Saudi-Arabia, Malaysia, China, and Nigeria [14, 15, 16, 17]. All studies found high levels of knowledge, positive attitudes, and safe practices. Some of the other KAP studies surveyed different sample groups such as medical students in Jordan [18] and in Iran [19], dentists in Jordan [20], and health workers in China [21] and Italy [22].

In response to the pandemic, countries issued restrictive measures including total or partial lockdowns and travel restrictions to prevent the spread of the virus [23]. The same actions were implemented in the KRI on March 17th 2020, mainly in Garmian Region, which borders Iran where cases were surging. When the first case was detected in KRI, local authorities declared complete lockdown which included closing schools and universities and restricting movements, and social gatherings. Despite implementing these measures, cases started to raise steadily in all the four governorates of Kurdistan, including Garmian Region, especially after easing the first lockdown [3].

The first case of Covid-19 was diagnosed on May 21st, 2020 and shortly thereafter, the number of cases increased significantly, according to local health authorities (DoH Garmian, February 22nd, 2021). As of March 2021, there are 6059 (3%) confirmed cases, with 4092 (67.5%) recoveries and 185 (3%) deaths among the 202,214 persons residing in Garmian region [24].

This KAP study was conducted to assess adults' knowledge, attitudes, and practice toward the COVID-19 pandemic in Garmian region and the relationships among sociodemographic data and knowledge, attitudes, and practice, also to answer the following questions:

- Are there good levels of knowledge about COVID-19 in Garmian, positive attitudes about the control of the virus, and healthy practices to avoid the spread of the virus and to prevent getting infected?
- Are there differences in levels of knowledge, attitudes, and practice with different socio-demographic characteristics?

Is the level of education about COVID-19 affects the positive attitudes and/or the practice of healthy measures to prevent the spread of the virus?

2. Methodology

Study design and setting:

A quantitative, descriptive, online cross-sectional survey was conducted during a complete lockdown from 5th to 20th of April 2020 in Garmian, an administrative region in South-East of KRI consisting of three districts Khanaqin, Kifri and Kalar, all bordering Iran. It was not feasible to draw a community-based sample because of the lockdown measures imposed by the authorities. Data were collected online using a Google platform designed by the authors.

Study participants and data collection

A non-probability, convenient sampling was used for data collection. Participation was restricted to Garmian residents, males and females, age 18 years old and older who are willing to participate and have access to the internet. Questionnaires in Arabic and Kurdish languages were prepared and sent to public websites and community groups in the Garmian Region. Data were collected over a two-week period. Three hundred twenty-five participations have completed the survey.

Study Questionnaire

The questionnaire was based on a study conducted in Wuhan, China [16]. It was modified/adapted by the authors according to the study objectives and context. It consisted of two parts: demographics and KAP indicators. Demographic variables included age, gender, marital status, education, occupation, and current residence. Nine extra questions were added to the original questionnaire: two questions for knowledge, two for attitudes and five for practices. The final version consisted of 14 questions about knowledge, four questions about attitudes, and seven questions about practice with (yes, no, I do not know) answer options. The scores were as follow for knowledge (0-4= poor knowledge; 5-9= moderate knowledge; 10-14= good knowledge); for attitudes (0-1= negative attitudes; 2= neutral attitudes; 3-4= positive attitudes); and for practice (0-2= poor practice; 3-4= fair practice; 5-7= good practice). The questionnaire was translated from English to Kurdish and Arabic; both versions were back translated and approved by linguistic experts. A correct answer was assigned one point and an incorrect/unknown answer was assigned 0 points. The total knowledge score ranged from 0 to 14, with a higher score indicating a better knowledge of COVID-19. With respect to attitudes and practice, correct answers (yes) indicated positive attitudes and correct practice. The Cronbach's alpha coefficient of the questionnaire was 0.73 in our sample, indicating acceptable internal consistency.

Ethical consideration

The Ethical Committee of Research Center, University of Garmian reviewed and approved the study proposal and procedures before the survey was implemented on April 1st 2020 (GRCEC104). Informed consent was taken from the participants by clarifying the purpose of the study, giving a brief background about the study and by choosing "Agree to participate" prior to answering the questionnaire.

Analysis Methods

In this study the authors have employed a primarily univariate and multivariable regression data analyses. The univariate analysis was done for tabulating the frequency of social and demographic statistics. Due to the continuous scores that were found in the results, authors have done a multivariable linear regression analysis to identify factors related to knowledge, attitudes, and practice. All analyses were conducted using SPSS 22 (SPSS Inc., Chicago, Ill., USA).

3. Results

Social and Demographic Characteristics:

In this study 325 participants have completed the online questionnaire; 138 (42.5%) women and 187 (57.5%) men. In Table 1 the social and demographic characteristics of the participants are showed. The mean of COVID-19 knowledge, Attitudes, and Practice scores were 7.14 (SD = 2.89, range: 1-14); 6.82 (SD = 2.16, range:4.12); 3.72 (SD = 1.96, range: 0-7) respectively.

Table 1: Social and demographic characteristics of the study participants

Variable	Mean	SD	Min	Max	N	%
Knowledge Score	7.14	2.89	1	14		
Attitude score	6.82	2.16	4	12		
Practice score	3.72	1.96	0	7		
Gender						
Male					187	57.5
Female					138	42.5
Age						
18-29					117	36.0
30-39					118	36.3
40-49					73	22.5
50-59					15	4.6
>60					2	0.6
Marital status						
Married					24	75.1
Single					73	22.5
Widow& divorced					8	2.5
Education						
Illiterate					41	12.6
Read& write					36	11.1

Variable	Mean	SD	Min	Max	N	%
Primary					41	12.6
Secondary					38	11.7
Preparatory					16	4.9
Diploma					45	13.8
Bachelor					52	16.0
High diploma					11	3.4
Master					29	8.9
Ph.D.					16	4.9
Occupation						
Governmental					118	36.3
Non-governmental					14	4.3
Retired					2	0.6
Jobless (unemployed)					30	9.2
Self-employed					32	9.8
Housekeeper					60	18.5
Student					69	21.2

The age of the majority of this study samples (72.3%) were between the ages of 18 and 39; about 244 were married (75.1%) and 73 were unmarried (22.5%), while the others were widowed or divorced (2.5%). The educations of the sample were as follow: (13.8%) hold diploma and 33.2% of participants had a college or university degree. In terms of occupation, 118 (36.3%) were government employees. Only 2 (0.6%) of the participants were retired, while 30 (9.2%) were unemployed.

Table 2: Responses about COVID-19 knowledge, attitudes, and practice among respondents:

S.no	Questions	Frequency		
		Correct (N, %)	Incorrect (N, %)	I don't know (N, %)
K1	To prevent COVID-19 infection, should individuals avoid going to crowded places such as bus stations and avoid taking public transportations?	242(74.4)	9(2.8)	74(22.7)
K2	To avoid transmitting of COVID-19, should we stop shaking hands?	219(67.5)	19(5.8)	87(26.7)
K3	Do you think that COVID-19 virus spreads via respiratory droplets from infected individuals?	201(61.7)	40(12.2)	84(26.2)
K4	Do you think fear and anxiety of getting infected with COVID-19 decreases immunity?	127(38.9)	58(17.8)	140(43.2)
K5	Do infected persons with COVID-2019 transmit the virus to others when not feverish?	116(35.6)	128(39.2)	81(25.1)
K6	Is there any effective cure for COVID-2019 at this time?	124(38.06)	136(41.7)	65(19.9)
K7	Are the principal clinical symptoms of COVID-19 fever, fatigue, dry cough, and myalgia?	204(62.6)	49(14.9)	73(22.5)
K8	Are a stuffy - runny nose, and sneezing less common in persons infected with the COVID-19 compared with the common cold?	190(58.3)	59(18.2)	76(23.4)
K9	Not all persons with COVID-2019 will become severe cases. Do those who are elderly and have chronic illnesses more likely to develop severe cases?	168(51.7)	49(15.1)	108(33.2)
K10	Should ordinary residents wear masks and gloves to prevent infection by the COVID-19 virus?	158(48.5)	78(24.1)	89(27.4)
K11	Is it necessary for children and young adults to take preventive measures to prevent COVID-19 infection?	131(40.2)	81(24.9)	113(34.8)
K12	Is it necessary to isolate people who are infected with COVID-19 to reduce the spread of the virus?	188(57.7)	98(30.0)	39(12.3)

K13	Do people who have contact with someone infected with a confirmed case of COVID-19 be immediately isolated in a proper place for 14 days?	85(26.0)	62(19.1)	178(54.8)
K14	Is supportive treatment and early diagnosis of COVID-19 patients helpful in curing a case?	156(47.8)	45(13.8)	124(38.3)
A1	Do you think that Garmian authorities have been taking the necessary steps to control the COVID-19 pandemic?	129(39.7)	142(43.7)	54(16.6)
A2	Do you think that people in Garmian region are following the public health instructions properly to protect themselves from COVID-19?	65(20.0)	192(59.1)	68(20.9)
A3	Do you agree that the COVID-19 pandemic will finally be successfully controlled?	150(46.05)	112(34.3)	63(19.5)
A4	Do you think that following the protective instructions could help in controlling COVID-19?	166(50.9)	93(29.5)	63(19.5)
P1	In recent days, have you gone to any crowded place such as markets/public places?	186(57.1)	62(19.1)	77(23.7)
P2	In recent days, have you visited your friends, relatives?	187(57.4)	49(15.1)	61(27.4)
P3	Do you respect the curfew?	183(65.1)	78(24.1)	64(19.7)
P4	In recent days, have you worn a mask when leaving home?	144(47.4)	99(30.3)	72(22.2)
P5	In recent days, do you wear gloves when you go out?	141(43.2)	105(32.4)	79(24.3)
P6	In recent days, do you usually wash your hands when entering your home?	193(59.2)	69(21.1)	63(19.3)
P7	If you develop COVID-19 signs and symptoms, are you ready to report your symptoms to the authorities?	169(51.8)	72(22.10)	84(25.7)

Level of knowledge, attitudes, and practice were also assessed across the education groups. Figures 1–3 show the results. Figure 1 suggests that the level of knowledge increases with educational attainment, Figure 2 shows that there were no discernible patterns across education groups although higher education levels decreased negative attitude, and Figure 3 indicate that with higher educational levels correct practices toward COVID-19 were higher.

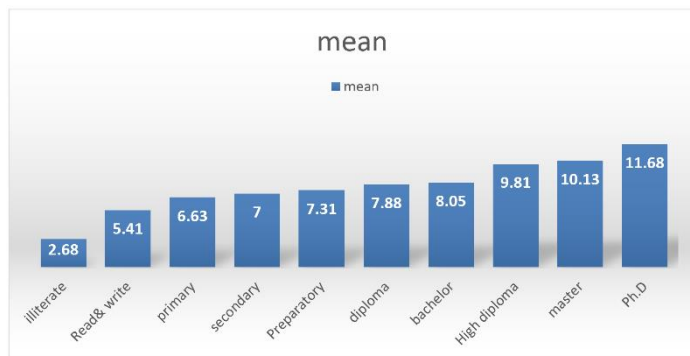


Figure 1: Knowledge levels about COVID-19 by education groups

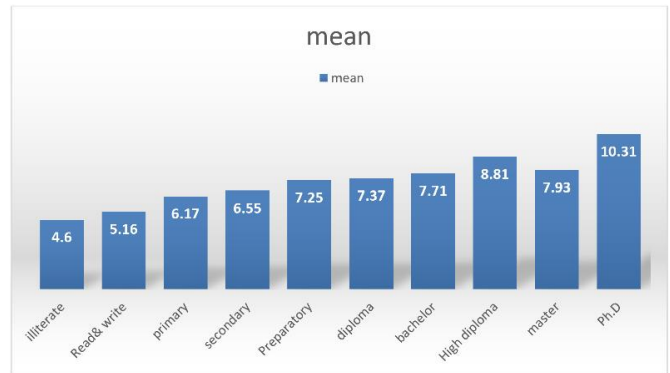


Figure 2: Attitude about COVID-19 by level of educational groups

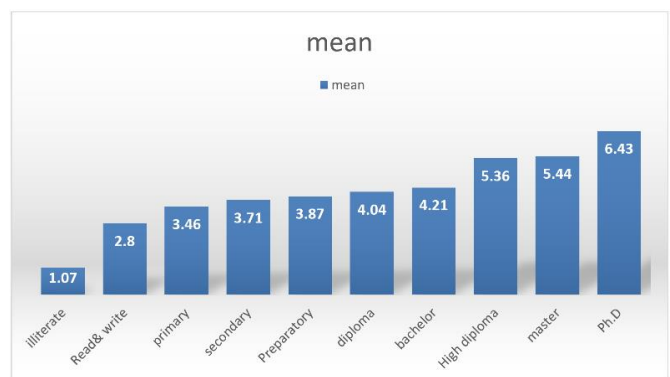


Figure 3: Correct practices for COVID-19 by levels of education

Table 3: Correlations among knowledge, attitude and practice:

		Knowledge	Attitude	Practice
Knowledge	*r (p-value)	1	0.19 (0.001) **	0.26 (0.000) **
Attitude	*r (p-value)		1	0.000) **

*. r correlation coefficient. **. Correlation is significant (0.01). This table certifies significant correlation among knowledge, attitude and practice.

Table 4: Association between participants' characteristics and level of knowledge

Age Groups		Knowledge Levels			Total
		Good	Moderate	Poor	
< 20	F	3	3	1	7
	%	42.9%	42.9%	14.3%	100%
20-50	F	154	137	7	298
	%	51.7%	46.0%	2.3%	100%
> 50	F	13	6	1	20
	%	65.0%	30.0%	5.0%	100%
		Chi-Square	5.73	P	0.22
Gender					
Male	F	95	74	6	175
	%	54.3%	42.3%	3.4%	100.0%
Female	F	75	72	3	150
	%	50.0%	48.0%	2.0%	100.0%
		Chi-Square	1.47	P	0.48
Marital Status					
Single	F	60	57	3	120
	%	50.0%	47.5%	2.5%	100.0%
Married	F	110	89	6	205
	%	53.7%	43.4%	2.9%	100.0%
		Chi-Square	0.53	P	0.78
Educations					
Postgraduate	F	57	42	2	101
	%	56.4%	41.6%	2.0%	100%
Institute/University	F	100	79	2	181
	%	55.2%	43.6%	1.1%	100%
Less than Institute	F	13	25	5	43
	%	30.2%	58.1%	11.6%	100%
		Chi-Square	20.85	P	0.000
Occupations					
Gov't. Employee	F	112	90	4	206
	%	54.4%	43.7%	1.9%	100.0%
Retired/Jobless	F	14	17	3	34
	%	41.2%	50.0%	8.8%	100.0%
Self-Employed	F	13	8	1	22
	%	59.1%	36.4%	4.5%	100.0%
Students	F	31	31	1	63
	%	49.2%	49.2%	1.6%	100.0%
		Chi-Square	7.74	P	0.25
Total	F	170	146	9	325
	%	52.3%	44.9%	2.8%	100%

Table 5: Association between participants' characteristics and level of attitude

Age Groups		Attitude Levels			Total
		Positive	Neutral	Negative	
< 20	F	1	3	3	7
	%	14.3%	42.9%	42.9%	100.0%
20-50	F	67	108	123	298
	%	22.5%	36.2%	41.3%	100.0%
> 50	F	4	10	6	20
	%	20.0%	50.0%	30.0%	100.0%
		Chi-Square	1.86	P	0.76
Gender					
Male	F	38	64	73	175

	%	21.7%	36.6%	41.7%	100.0%
Female	F	34	57	59	150
	%	22.7%	38.0%	39.3%	100.0%
		Chi-Square	0.19	P	0.91
Marital Status					
Single	F	28	41	51	120
	%	23.3%	34.2%	42.5%	100.0%
Married	F	44	80	81	205
	%	21.5%	39.0%	39.5%	100.0%
		Chi-Square	0.77	P	0.68
Educations					
Postgraduate	F	17	44	40	101
	%	16.8%	43.6%	39.6%	100.0%
Institute/University	F	47	66	68	181
	%	26.0%	36.5%	37.6%	100.0%
Less than Institute	F	8	11	24	43
	%	18.6%	25.6%	55.8%	100.0%
		Chi-Square	8.3	P	0.08
Occupations					
Gov Emil	F	46	80	80	206
	%	22.3%	38.8%	38.8%	100.0%
Retired/Jobless	F	11	7	16	34
	%	32.4%	20.6%	47.1%	100.0%
Self-employ	F	5	8	9	22
	%	22.7%	36.4%	40.9%	100.0%
Students	F	10	26	27	63
	%	15.9%	41.3%	42.9%	100.0%
		Chi-Square	6.23	P	0.39
Total	F	72	121	132	325
	%	22.2%	37.2%	40.6%	100.0%

Table 6: Association between participants' characteristics and level of practice

Age Groups		Practice Levels			Total
		Good	Fair	Poor	
< 20	F	1	3	3	7
	%	14.3%	42.9%	42.9%	100.0%
20-50	F	137	58	103	298
	%	46.0%	19.5%	34.6%	100.0%
> 50	F	10	4	6	20
	%	50.0%	20.0%	30.0%	100.0%
		Chi-Square	7.32	P	0.44
Gender					
Male	F	66	37	72	175
	%	37.7%	21.1%	41.1%	100.0%
Female	F	82	28	40	150
	%	54.7%	18.7%	26.7%	100.0%
		Chi-Square	10.26	P	0.006
Marital Status					
Single	F	57	18	45	120
	%	47.5%	15.0%	37.5%	100.0%
Married	F	91	47	67	205
	%	44.4%	22.9%	32.7%	100.0%
		Chi-Square	3.01	P	0.22
Educations					
Postgraduate	F	46	23	32	101
	%	45.5%	22.8%	31.7%	100.0%

Institute/University	F	86	33	62	181
	%	47.5%	18.2%	34.3%	100.0%
Less than Institute	F	16	9	18	43
	%	37.2%	20.9%	41.9%	100.0%
		Chi-Square	2.41	P	0.66
Occupations					
Gov employ	F	102	39	65	206
	%	49.5%	18.9%	31.6%	100.0%
Retired/Jobless	F	13	8	13	34
	%	38.2%	23.5%	38.2%	100.0%
Self-employ	F	14	3	5	22
	%	63.6%	13.6%	22.7%	100.0%
Students	F	19	15	29	63
	%	30.2%	23.8%	46.0%	100.0%
		Chi-Square	11.17	P	0.08
Total	F	148	65	112	325
	%	45.5%	20.0%	34.5%	100.0%

Tables 4, 5, and 6 show the relationship between socio-demographic characteristics with knowledge, attitudes, and practice respectively. The chi-square analysis indicates no

significance association, only for educational level and knowledge (0.000), also for gender and practice (0.006) which both of them are highly significant.

Table 7: Comparison of social and demographic characteristics, and mean KAP scores:

Variable	N	%	Knowledge score			Attitude score			Practice score		
			Mean	SD	P	Mean	SD	P	Mean	SD	P
Gender											
Male	187	57.5	7.65	2.70	<0.001	7.18	2.14	<0.001	3.89	1.89	0.07
Female	138	42.5	6.49	2.99		6.33	2.10		3.50	2.04	
Age											
18-29	117	36.0	7.68	2.85	<0.001	7.01	2.29	<0.05	4.13	1.99	<0.001
30-39	118	36.3	7.61	2.84		7.16	2.15		3.85	1.88	
40-49	73	22.5	6.12	2.56		6.24	1.92		3.15	1.79	
50-59	15	4.6	4.66	2.63		5.60	1.50		2.53	2.29	
>60	2	0.6	4.00	0.01		5.50	0.70		2.00	0.01	
Marital status											
Married	244	75.1	6.72	2.86	<0.001	6.52	2.0	0.23	3.65	2.07	<0.05
Single	73	22.5	4.62	4.59		6.12	3.04		2.00	2.50	
Widow& divorced	8	2.5	7.35	2.79		6.93	2.17		3.80	1.89	
Education											
Illiterate	41	12.6	2.68	0.75	<0.001	4.60	0.58	<0.001	1.37	0.84	<0.001
Read& write	36	11.1	5.41	1.50		5.16	1.32		2.80	1.30	
Primary	41	12.6	6.63	1.86		6.17	1.37		3.46	1.68	
Secondary	38	11.7	7.00	1.64		6.55	1.55		3.71	1.73	
Preparatory	16	4.9	7.31	1.66		7.25	1.77		3.87	1.74	
Diploma	45	13.8	7.88	1.95		7.37	1.77		4.04	1.56	
Bachelor	52	16.0	8.05	1.75		7.71	1.90		4.21	1.74	
High diploma	11	3.4	9.81	1.66		8.81	1.72		5.36	1.02	
Master	29	8.9	10.13	2.37		7.93	2.28		5.44	1.21	
Ph.D.	16	4.9	11.68	3.07		10.31	2.16		6.43	0.72	
Occupation											
governmental	118	36.3	7.29	2.73	<0.001	7.16	2.16	<0.05	3.97	1.81	<0.001
Non-governmental	14	4.3	5.92	2.97		6.85	2.21		2.71	2.05	
Retired	2	0.6	9.50	2.12		7.50	0.70		6.50	0.70	
Jobless	30	9.2	5.73	3.19		6.23	2.43		2.86	2.04	
Personal-job	32	9.8	6.78	3.03		6.81	2.23		3.50	2.07	
Home keeper	60	18.5	6.11	2.82		6.03	1.96		3.31	2.15	
Student	69	21.2	7.68	2.42		7.15	2.0		4.26	1.68	

In Table 7, all the scores for KAP were statistically different for all age groups, education and occupation groups. However, there was no statistically significant difference in attitudes across marital status. Gender differences, in male and female practice, were not significantly different.

Beside the univariate and non-parametric analyses that were used in this study, authors have also performed regression analysis. Scores were logged for all variables, and interpreted using ordinary least squares (OLS). Increased scores imply increased knowledge of the pandemic, more positive attitude to embrace preventive practices and the adoption of proper protective practices. The results are shown in Table 8

Table 8: Regression results of KAP-related factors for COVID-19

Variable	Attitude		
	Knowledge	Attitude	Practice
	β(SE)	β(SE)	β(SE)
Gender			
Female	-0.19(0.31) (0.001) **	-0.18 (0.23) (0.001) **	-0.08(0.22) (0.13)
Age			
18-29	-0.01(0.36) (0.85)	-0.03(0.27) (0.58)	-0.06(0.25) (0.26)
40-49	-0.21(0.41) (0.001) **	-0.17(0.31) (0.05) *	-0.15(0.28) (0.05) *
50-59	-0.21(0.76) (0.001) **	-0.15(0.58) (0.05) *	-0.14(0.52) (0.05) *
>60	-0.09(1.97) (0.06)	-0.06(1.52) (0.27)	-0.07(1.37) (0.17)
Marital status			
Single	-0.53(1.46) (0.05) *	-0.42(1.13) (0.05) *	-0.43(1.0) (0.05) *
Married	-0.51(1.5) (0.05) *	-0.39(1.17) (0.05) *	-0.47(1.0) (0.05) *
Widow & divorced	-0.38(1.1) (0.001) **	-0.22(1.1) (0.001) **	-0.36(0.81) (0.05) *
Education			
Illiterate	0.36(0.97) (0.001) **	-0.28(0.90) (0.05) *	0.48(0.78) (0.001) **
Read and write	0.04(0.95) (0.64)	-0.19(0.88) (0.12)	0.18(0.77) (0.13)
Primary	0.16(0.92) (0.13)	0.03(0.86) (0.81)	0.01(0.75) (0.91)
Secondary	0.12(0.97) (0.24)	0.04(0.90) (0.97)	0.04(0.78) (0.75)
Preparatory	0.09(1.0) (0.20)	0.04(0.97) (0.64)	0.02(0.84) (0.76)
Diploma	0.14(0.94) (0.18)	0.06(0.88) (0.61)	0.04(0.77) (0.74)
High diploma	0.31(0.92)	0.22(0.86)	0.07(0.75)

Variable	Attitude		
	Knowledge	Attitude	Practice
	β(SE)	β(SE)	β(SE)
Bach lore	(0.05) * 0.26(1.0) (0.001) **	(0.14) 0.19(0.99) (0.05) **	(0.08) 0.14(0.86) (0.05) *
Master	0.42(0.98) (0.001) **	0.19(0.92) (0.11)	0.22(0.80) (0.05) *
Ph.D.	0.44(1.0) (0.001) **	0.38(0.96) (0.001) **	0.27(0.83) (0.05) *
Occupation			
Non-governmental	-0.14(0.78) (0.05) *	0.02(0.62) (0.60)	-0.13(0.54) (0.05) *
Retired	-0.04(1.9) (0.42)	-0.01(1.52) (0.82)	-0.10(1.3) (0.05) *
Jobless	-0.03(0.42) (0.56)	0.002(0.32) (0.97)	-0.06(0.29) (0.32) *
Personal-job	-0.11(0.55) (0.05) *	0.04(0.42) (0.40)	0.07(0.38) (0.21)
House keeper	-0.24(0.44) (0.001) *	-0.20(0.33) (0.001) **	-0.13(0.30) (0.05) *
Student	-0.25(0.56) (0.001) **	-0.12(0.43) (0.05) *	-0.16(0.39) (0.05) *
Knowledge		0.80(0.02) (0.001) **	0.77(0.02) (0.001) **

Standard error in parenthesis, P<0.001*, P<0.05**

As it is shown in Table 8, knowledge about COVID-19 of the age groups 18-28, 40-49, 50-59 and ≥ 60, showed more knowledgeable about COVID-19 than the reference group (29-39). Variables for the age groups 40-49 (β = -0.21; p < 0.001), 50-59 (β = -0.21; p < 0.001) are statistically significant at the 1% level. In attitudes 40-49 (β = -0.17; p < 0.05) and 50-59 (β = -0.15; p < 0.05) are significantly different from the baseline. In case of practices for COVID-19, the age group 40-49 (β = -0.17; p < 0.05) and 50-59 (β = -0.14; p < 0.05) are associated with good practices. There was relationship between education and occupation with knowledge, attitude, and practice. The scores of KAP increased by increasing education level. Among occupation groups, the students have shown higher beta=-25.

Regarding gender, the results indicate that woman have higher knowledge (β = -0.19; p < 0.001), positive attitudes (β = -0.18; p < 0.001) compared to men. In practices for COVID-19 there were no significant difference between both genders. Also, no difference in KAP toward COVID-19 was observed in marital status of widow and married. While in marital status group, single participants had higher knowledge (β = -0.53; p < 0.001), positive attitudes (β = -0.42; p < 0.001), and good practices for COVID-19 (β = -0.19; p < 0.001) compared to married participants.

For studying the statistical association between KAP scores, regression analysis was performed. Table 6 shows that every increase of 1% in knowledge score is associated an increase in a positive attitude and correct practices scores, of 0.80 and 0.77, respectively.

Table 9: chi-square test for gender and knowledge, attitudes, and practice:

S.no	Questions	Pearson Chi-Square value	Sig.
K1	To prevent COVID-19 infection, should individuals avoid going to crowded places such as bus stations and avoid taking public transportations?	2.924	0.087
K2	To avoid transmitting of COVID-19, should we stop shaking hands?	6.638	0.010
K3	Do you think that COVID-19 virus spreads via respiratory droplets from infected individuals?	0.372	0.542
K4	Do you think fear and anxiety of getting infected with COVID-19 decreases immunity?	3.172	0.075
K5	Do infected persons with COVID-2019 transmit the virus to others when not feverish?	14.612	0.000
K6	Is there any effective cure for COVID-2019 at this time?	13.678	0.000
K7	Are the principal clinical symptoms of COVID-19 fever, fatigue, dry cough, and myalgia?	1.215	0.27
K8	Are a stuffy - runny nose, and sneezing less common in persons infected with the COVID-19 compared with the common cold?	0.005	0.942
K9	Not all persons with COVID-2019 will become severe cases. Do those who are elderly and have chronic illnesses more likely to develop severe cases?	0.863	0.353
K10	Should ordinary residents wear masks and gloves to prevent infection by the COVID-19 virus?	8.059	0.005
K11	Is it necessary for children and young adults to take preventive measures to prevent COVID-19 infection?	0.247	0.619
K12	Is it necessary to isolate people who are infected with COVID-19 to reduce the spread of the virus?	0.439	0.538
K13	Do people who have contact with someone infected with a confirmed case of COVID-19 be immediately isolated in a proper place for 14 days?	0.022	0.881
K14	Is supportive treatment and early diagnosis of COVID-19 patients helpful in curing a case?	0.357	0.550
A1	Do you think that Garmian authorities have been taking the necessary steps to control the COVID-19 pandemic?	2.650	0.266
A2	Do you think that people in Garmian region are following the public health instructions properly to protect themselves from COVID-19?	5.578	0.061
A3	Do you agree that the COVID-19 pandemic will finally be successfully controlled?	2.115	0.347
A4	Do you think that following the protective instructions could help in controlling COVID-19?	6.649	0.039
P1	In recent days, have you gone to any crowded place such as markets/public places?	2.879	0.090
P2	In recent days, have you visited your friends, relatives?	26.973	0.000
P3	Do you respect the curfew?	0.675	0.411
P4	In recent days, have you worn a mask when leaving home?	5.214	0.022
P5	In recent days, do you wear gloves when you go out?	0.546	0.460
P6	In recent days, do you usually wash your hands when entering your home?	0.002	0.967
P7	If you develop COVID-19 signs and symptoms, are you ready to report your symptoms to the authorities?	1.288	0.256

The Chi-square analysis shows that there is no significance relationship between the gender and knowledge, attitudes, and practice, only in few questions as follows: K2, K5, K6, and K10; A4; and P2, P4 for knowledge, attitudes, and practice respectively.

4. Discussions

To the best of our knowledge, this is the first KAP study among this population in Garmian Region and the second in KRI during the COVID-19 pandemic. Participants had positive and negative

attitudes with similar rates. Questions A1 and A2 had higher negative responses, while A3 and A4 had higher positive attitudes. The positive attitudes were that this pandemic will end and that applying protective measures will help to prevent the virus spread. The negative attitudes were about the administration's necessary steps in controlling the spread of the pandemic in the region, and that the population of the region is not following instructions properly. In spite of negative attitudes, the KRI authorities played a crucial role in controlling the spread of the virus. Studies show that the lockdown by governments was effective in controlling the spread of the COVID-19 [25, 26].

While in the practice questions, all the seven questions (P1-P7) had higher rates of correct answers, which indicates good practice levels among participants.

The majority of the participants show a good level of knowledge about COVID-19. Studies, conducted in Iraq [7, 8, 9, 10, 27], and in Iran, Syria and Saudi Arabia, show similar satisfactory levels of knowledge, attitudes and practice [14, 28, 29]. Another study by Zhong et al, 2020 reported higher levels of knowledge (90%) among Chinese at the very beginning of the pandemic.

Based on the finding of this study, the absence of COVID-19 in the Garmian region was not due to a good knowledge, attitudes and practice of the community, but to the strict lockdown measures, such as imposing a curfew, closure of schools and universities, markets and prevention of social gathering, wearing masks and using of distinct, implemented by the local authorities. After easing these measures in early May 2020, cases were recorded and increased rapidly. It was reported that easing the lockdown measures in Garmian region contributed to the second spike of COVID-19 after a two-week period in which no cases were recorded [27].

After six months of the virus spreading globally, people in Garmian had less knowledge than the Chinese population for example despite the availability of many resources including news channels, studies, social media and newspapers, whom have been giving awareness and up to date statistics every day. This suggests that the community was not taking the pandemic seriously and was not paying much attention to the information disseminated/circulated. At the beginning of the lockdown, people refused to follow instructions and the government was struggling to keep community members sheltering in place and follow the protective/ preventive measures. Low knowledge levels about K5 and K6 explains the rapid spread of the pandemic. Higher levels of education have shown higher knowledge and good practices regarding COVID-19, but not for attitudes. At the same time, with higher educational levels, negative attitudes were less when compared with respondents in lower educational levels. Similar results were found in other KAP studies that were conducted among health workers and dentists in China, Italy, Iran, Jordan and Iraq respectively [11, 18, 19, 21, 22] and among other Iraqi communities [8].

The sociodemographic characteristics, age, education, and occupation were not significantly different for KAP. Gender and marital status were statistically significant for knowledge and practice. Ghazi et al, also found that there is a significant relationship between the knowledge score and both gender and living state [9].

All the age groups had good knowledge, but the age group of 29-39 had less knowledge compared to others. Higher positive attitudes and better practices were found among age groups 40-49 and 50-59. These findings are similar to the findings of another study which reported that younger age groups in the KRI have better knowledge and more positive attitudes, while older age groups have better practices [10]. This explains that older people pay more attention to the information about COVID-19, since risks are higher for older people [31, 32, 33].

We have found that increased knowledge is associated with an increase of attitudes and practice as well. There is a relationship between education and occupation as the scores increased with increased educational levels. There is a direct relationship between knowledge, attitudes and correct practice, suggesting

that correct knowledge leads to positive attitudes and correct, appropriate practice [34].

We recommend preparing and disseminating health awareness campaigns to the population about public health preparedness and preventive measures in dealing with disease outbreaks. In addition, we encourage researchers to conduct studies in the region to inform decision makers on best practices.

5. Conclusion

The assessment of knowledge, attitudes and practices of adults in the Garmian Region with respect to COVID-19 has shown that more than half of the study participants had good Knowledge and high levels of correct practice. There is a significant relationship between knowledge and attitudes and correct practice; participants with higher knowledge score have more positive attitudes and better practices. There are no significance differences between the socio-demographic characteristics and levels of knowledge, attitudes and practices. The findings of this study will inform the decision makers in the KRI and in Garmian region about the measure to put in place when facing future disease outbreaks and public health emergencies.

Limitations

The data of this study was collected online, and this excluded participants who did not have access to internet or whom are not familiar with such platform to participate. This makes it difficult for the results to be generalized. The study was conducted when there were only few cases in the region. Therefore, the results of this study might have been different if conducted among the general population and when cases and mortality increased dramatically.

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Author's contribution

MY designed the online form and performed the data collection; MA did the statistical analysis; NA, NA, and DJ worked on the writing of the research sections.

Conflict of interests

None.

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