



## Knowledge, Attitudes, and Beliefs perception regarding Covid-19 Vaccination among the General Population of Gaza strip-Palestine

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### ABSTRACT

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As known recently Coronavirus disease 2019 or Covid-19 is an emerging public health concern that threatens the lives of over 2.4 million people worldwide.

The Palestinian government plans to ensure the COVID-19 vaccine through several agencies and companies to vaccinate at least the maximum population. This study aimed to assess the knowledge, attitude and the beliefs perception regarding Covid -19 and vaccination among a convenience sample of general Palestinian adults.

### Methodology

An online survey was conducted for 2 weeks in February 2022. A questionnaire in Arabic was set up using google form and the link was shared via social media like the WhatsApp site. The questionnaire includes questions related to the respondents' knowledge, attitude and beliefs about Covid-19 and its vaccine. Modified Bloom's cut-off of 76% was used to determine sufficient knowledge, good attitude and a score  $\geq 6$  to determine a good beliefs perception

### Results

Responses from 957 participants were analyzed. The majority of respondents were females (59.5%), and the mean age of participants was  $36 \pm 14.10$  years (range 18:77) years. Overall, 82.2% of respondents had average knowledge, 98.2% favorable attitude and 35% had good beliefs perception towards covid19 vaccine. The factor associated with average knowledge was the place of residence (Gaza city and north Gaza), (OR:1.6; 95%CI:1.15-2.29;  $p=0.005$ ). Factors associated with favorable attitude were news media (OR:4.8; 95% CI: 1.23-18.48;  $p=0.024$ ) and the presence of comorbidities (OR: 5.7; 95% CI:1.57-20.81;  $p=0.008$ ). Respondents who get their information from the media and who spent more than an hour to getting news have good beliefs concerning the Covid -19 vaccine.

**Conclusion:** The battle against COVID-19 continues around the world. To ensure ultimate success, informed awareness through a knowledge-building program and expanded vaccination are essential to improve the situation and stop the spread of the virus.

### KEYWORDS:

Covid-19; Knowledge; Attitudes; Briefs; Vaccine; Gaza-Palestine

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### 1. INTRODUCTION

Since the end of December 2019, the world has been confronted with an infectious disease COVID-19, which is caused by severe acute respiratory syndrome coronavirus 2 (SARS-COV-2). On 30 January 2020, the World health organization (WHO) declared a state of a public health emergency. Since then, this emerging and highly rapid increase in the incidence of the disease worldwide has spread to 223 countries and territories, rapidly leading to a global pandemic. As of 10 July 2022 nearly 553 million cases and

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over 6.3 million deaths have been reported globally [1]. In addition to the well-known effects of this disease on global health, this pandemic is a burden on the economic and social status of populations [2]. Covid-19 remains a challenge to be controlled in most countries of the world [3]. It primarily affects the respiratory system and can lead to acute hypoxemic respiratory failure, and 0.9% to 14% of these patients require admission to intensive care units for advanced respiratory support [4];

At present, vaccines are approved and recommended to prevent Covid-19. An estimated 15.6 billion doses of the Covid-19 vaccine are needed for all 194 WHO Member States to achieve universal vaccination with COVID-19 [5]. Since different Covid-19 vaccines have been marketed, countries around the world have formulated different vaccination strategies. The distribution of vaccines, particularly in many low- and lower-middle-income countries, needs strong national and international supply chains. In addition, the literature shows that hesitancy to vaccinate can affect the benefits of vaccination efforts [6]. Although studies have shown that in many countries the acceptance rate for vaccines is less than 60% [7].

Palestine, like many countries, is facing this epidemic and the Palestinian Ministry of Health (MOH) has reported 586058 cases and 5358 deaths up to 18 July 2022 (at the time of writing this article) [8]. Gaza strip, with its 365 km<sup>2</sup> and 2.1 million inhabitants, is one of the most crowded populations in the world: 5324 people per square kilometer [9]. In Palestine, the Covid-19 vaccine was launched in March 2021 and, based on priorities, vaccination was initially targeted at health workers and the national army as the first step. In a second step, vaccination was targeted at people over 65 years of age or with co-morbidities in order to reduce the number of severe cases, thus decreasing the number of hospitalizations, admissions to intensive care units and deaths. In a third step, vaccination was extended to the general population to reduce and eventually stop the burden of viral transmission and symptomatic infections.

To this intention, we conducted a cross-sectional survey via an online questionnaire to assess the knowledge, attitude and beliefs perception of Covid-19 and its vaccine among Palestinians residing in the Gaza Strip.

## 2. METHODS

This cross-sectional survey was conducted from February 3 and February 19/ 2022. An online link to the web-based anonymous questionnaire was developed using Google forms, and it was posted and shared by the study investigators via online social media platforms like WhatsApp (**supplementary file available**). Participants were recruited through convenience sampling from various population groups to achieve maximum diversity. Each individual who was  $\geq 18$  years of age and resident in one of five governments

of the Gaza strip was asked to complete an approximately 10 minutes interviewer-administration electronic questionnaire.

### 2.1. The sample sizes

The sample was calculated using single proportion formula based on the assumption that the probability of having poor knowledge, attitude and practice towards Covid 19 was 50%, at 95% CI, 3% margin of error; and determined to be 1066 by adding nonresponses rate of 10% the total sample size was: 957 participants.

### 2.2. Study variables and scoring

The questionnaire was composed of four main sections according to the final version of Kumari et al [10]. The first section of the questionnaire consists of the items related to sociodemographic characteristics, including age, gender, marital status, region of residence, education level, and occupation. The age group was categorized into 18-25 years; 26-40 years; 41-50 years and over 50 years. the regions of residence were classified as the central region (Gaza city and North Gaza); and the Southern region (Middle Gaza, Khan Younes and Rafah). The house crowding index (HCI) was defined and calculated as the total number of co-residents per household, excluding the newborn infant, divided by the total number of rooms, excluding the kitchen and bathroom [11] and classified the socioeconomic status as High (HCI<1); middle(HCI=1-2) and low (HCI>2) [12]. Farther, questions regarding the source of information on Covid-19 infection and vaccine were asked.

The second section of the questionnaire consists of the items related to the medical background including chronic medical disease and history of COVID-19 infection.

The third section of the questionnaire consists of the items regarding Knowledge and attitude about Covid-19 and its vaccine. This section was assessed using 7 questions for knowledge and 6 questions for attitude, the answer of every item was based on a 5-point Likert scale, the responses were strongly disagreed, neuter, not sure, somewhat agree and strongly agree, each weighing 1-5 respectively. Overall knowledge and attitude were categorized using modified Bloom's cut-off as sufficient if the score was between 76%-100%. moderate if the score was 36%-75%, and poor if the score was less than 35%.

The fourth section includes 10 questions that were used to assess participants' beliefs perception about the Covid-19 vaccine. Responses include three options: Eligible, not eligible and don't know. One mark was given for any correct answer and 0 mark for any wrong or don't the know answer. The maximum beliefs score was 10, and those who obtained marks above the median of the total score ( $\geq 6$ ) will be categorized as having positive beliefs. All Likert -item questions have been adopted from Goni et al [13], and appropriately modified for Covid-19 by the authors.

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## 2.3. Statistical analysis

The fully completed questionnaires were extracted from Google Forms and exported to a Microsoft Excel file for cleaning and coding, and then the data was exported to SPSS version 26.0 for analysis. Numerical data was summarized as mean and standard deviation. Categorical data were presented as frequency and percentages. Independent sample t-tests/ and one -way analysis of variance (ANOVA) were used to compare the mean knowledge score between different demographic groups. Modified Bloom’s cut-off of 76% was used to determine sufficient knowledge; and good attitude. Association between the independent variable and dependent variables were assessed using multivariate linear logistic regression analysis. A  $p < 0.005$  was considered statistically significant.

## 3. THE ETHICS STATEMENT

Ethical approval was obtained from the Palestinian ethical committee and consent for participants was obtained before participation in the study.

## 4. RESULTS

### 4.1. Sociodemographic characteristics of participants

A total of 1066 participants were invited to participate in the study, but only 957(89.8%) provided informed consent. The mean age of respondents was  $36.05 \pm 14.10$  years, almost third of the respondents were in the age group 18-25 years, and 16.7% were aged 50 years and above. The majority of respondents were female (59.5%). Over half of the participants has a bachelor’s degree (52.9%), and more than half of them were married. The majority of participants were

not employed (38.5%), 26.5% reported working in the private sector and half of the population belongs to a middle house crowding index. The main source of information about Covid-19 was from social media like Facebook and WhatsApp (69.8%) followed by the Ministry of Health (20.2%). More than two third of the population spent (1min-30mn) viewing news or information for Covid-19 /day (Table1)

### 4.2. Health status of respondents

Table 2 shows the summary statistics of the health condition of the respondents, their worries about the Covid- 19 infection and their intention to accept the vaccine. Our data revealed that 18.7% of respondents had more than two chronic diseases, 7.2% and 2.1% of them were hypertensive and diabetics respectively. Only 18.9% receive the influenza vaccine annually. Also, 38% of participants had been infected by Covid -19 virus, and about 2% of them declare to have had the disease 3 times (Fig1 A). For the question "What are you most worried about during Covid 19? 39.4% responded that they were afraid that of a family member getting infected and 23.5% declared that they were not worried. In response to the question "What factors influence your decision to be vaccinated with Covid 19?" 45.7% replied that the cause was the excessive number of positive Covid -19 cases. Knowing that 16.4% of the participants reported that they have not been vaccinated with Covid -19 vaccine (Fig1B). Slightly more than a quarter of respondents did not require medical care (Fig1C). Pfizer vaccine was given to 48% of respondents, while the sputnik vaccine was given to 27% (Fig 1D). Also, 43% reported no reaction after vaccinations.

**Table 1: self-reported Baseline demographic and clinical characteristics of Participants**

Characteristics	No	%
Age		
Age in years (mean ± SD*)	36.05 ±14.10	
18-25 years	320	33.4
26-40 years	251	26.2
41-50 years	226	23.6
> 50 years	160	16.7
Gender		
Male	388	40.5
Female	569	59.5
Locality of residence		
Central region (Gaza+ North Gaza)	650	67.9
Southern region (South Gaza)	307	32.1
Education		
Secondary school or below	299	31.2
Bachelor’s degree	506	52.9
Post graduate degree	152	15.9
Occupation		
Governmental employee	225	23.5
Private sector	254	26.5

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Self employed	110	11.5
Non employed	368	38.5
Marital status		
Single	356	37.2
Married	561	58.6
Divorced/widow	40	4.2
House crowding index		
0-1.0 low	226	23.6
1.1-2.0 middle	509	53.2
>2.0 high	222	23.2
Source of Covid-19 information		
Social media	668	69.8
MOH**	193	20.2
Television	41	4.3
Friends or relatives	55	5.7
The time spent viewing news or information for Covid-19 /day		
1min-30min	639	66.8
30mn-1h	98	10.2
>1h	82	8.6
None	138	14.4

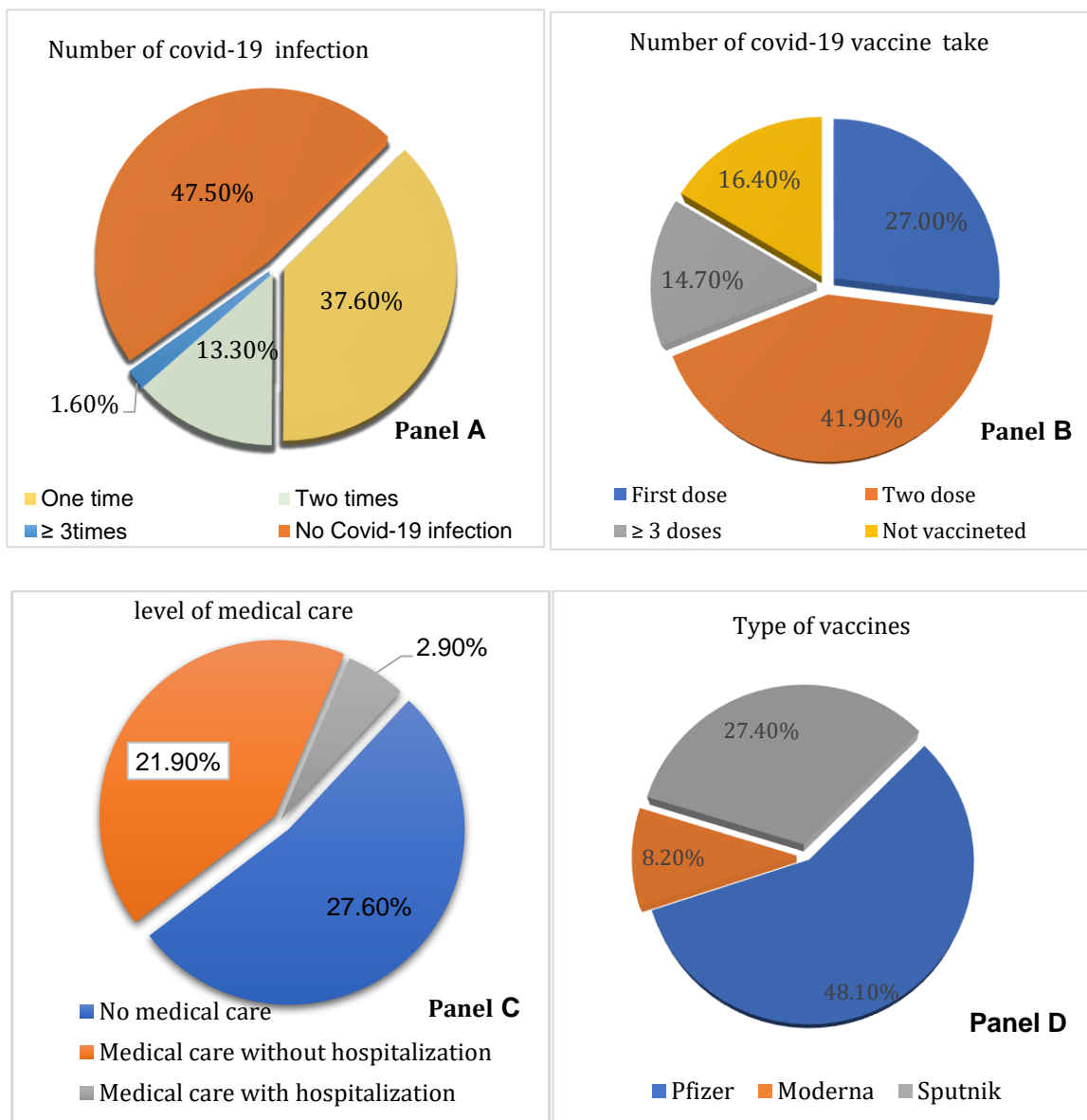
\*SD: standard deviation; \*\*MOH: Ministry of Health

**Table 2: Health status of participants, the worries about covid-19 infection and the intention to accept vaccine**

Comorbidities /Covid-19 history/vaccine take	No	%
Hypertension	69	7.2
Diabetes	20	2.1
More than 2 chronic diseases	179	18.7
No comorbidities	741	77.4
Chronic medication intake	165	17.2
History of Covid -19 infection		
Have you or family number had covid-19		
I have covid-19	118	12.3
A family number has had Covid-19	246	25.7
I and at least one family number has had Covid-19	360	37.6
Neither me or them has Covid -19	233	24.3
What are you most worried about during Covid -19?		
Fear of becoming infected	214	22.4
Fear of family member to be infected	377	39.4
Job related worries	33	3.4
No available treatment	108	11.3
Not worries	225	23.5
Covid-19 vaccination		
What are the factors that influence your decision to take Covid -19 vaccine?		
Effectiveness	235	24.6
Obligation of the government	270	28.2
Excess number of positive Covid- 19 case	437	45.7
Adverse effect	15	1.6
What would motive you to get vaccination		
Protect my health	229	23.9
Protect health of my family and friends	340	35.5
Protect health of the community	230	24.0
Because others encouraged me to get vaccinated	37	3.9

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Not sure	121	12.6
Have you had an allergic reaction to the Covid-19 vaccine		
Slight swelling reaction	124	13.0
Fever	141	14.7
Asthenia	164	17.1
Flu reaction	116	12.1
No reaction	412	43.1



**Figure 1: Panel A: Number of Covi-19 infection; Panel B: Number of Covid 19 vaccine taken; Panel C: Level of medical care; Panel D: Type of vaccines**

**4.3. Knowledge regarding Covid -19 vaccine**

The overall mean score for knowledge was  $2.95 \pm 0.48$  and the mean per cent knowledge score was 42.14%. Almost 82.2% (n=787) of the participants scored (36%-75%) and were considered to have average knowledge. only 17.8% (n=170) of participants scored below 35%. The mean knowledge per cent score of male participants was higher than those of females (42.6% vs 41.7%), but the difference was not statistically significant (p=0.064). Respondents residing in

the central region of the Gaza strip were more knowledgeable than those in the southern region (42.3% and 41.6% respectively p=<0.001). Those who spent 30 minutes to 1-hour getting information about Covid- 19 were the most informed on the covid-19 situation compared to other groups (43.4%; p.value=0.031) (table3). The factor associated with average knowledge was only the place of residence (OR:1.6; 95% CI:1.15-2.29; p=0.005), (table 5, Figure2)

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### 4.4. Attitudes regarding Covid -19 vaccine

The overall mean score for attitude was  $3.01 \pm 0.34$  and the mean per cent score was 50.16%. Almost 98.2% (n=940) of the respondents scored (36%-75%) and were considered to have favorable or acceptable attitudes. The favorable attitude score was found to be maximum in males, respondents over 50 years of age, married, with low HCI, and in those who spend a 30min-1 hour getting information and news about Covid 19 (table 3). Multivariate analysis revealed that

respondents who get information through social media were five times more likely to have favorable attitude (OR:4.8;95%CI:1.23-18.48;  $p=0.024$ ). Similarly, respondents with comorbidities have six times higher favorable attitudes (OR:5.7; 95%CI:1.57-20.81;  $p=0.008$ ). There was no statistical correlation between knowledge, attitude and the sociodemographic variable (gender, age, level of education, marital status and occupation) (table 5, Figure3).

**Table 3: Mean percentage score of Knowledge, and attitude among the respondents by demographic group**

Characteristics	Knowledge (score%)	p.value	Attitudes (score%)	p.value
	Mean $\pm$ SD*		Mean $\pm$ SD	
Overall	42.08% $\pm$ 6.86	<0.001	50.12 $\pm$ 5.61	<0.001
<b>Gender</b>				
Male	42.58 $\pm$ 7.01	0.064	50.51 $\pm$ 6.03	0.015
Female	41.74 $\pm$ 6.76		49.61 $\pm$ 5.28	
<b>Age group</b>				
18-25 years	41.82 $\pm$ 6.97	0.204	48.72 $\pm$ 5.23	<0.001
26-40 years	41.55 $\pm$ 6.82		50.27 $\pm$ 5.69	
41-50 ears	42.66 $\pm$ 7.06		50.79 $\pm$ 5.59	
>50 years	42.63 $\pm$ 6.36		50.86 $\pm$ 5.82	
<b>Locality of residence</b>				
Central region (Gaza+ North Gaza)	42.31 $\pm$ 6.66	<0.001	50.14 $\pm$ 5.48	0.188
Southern region (South Gaza)	41.59 $\pm$ 7.26		49.63 $\pm$ 5.86	
<b>Education</b>				
Secondary school or below	42.37 $\pm$ 6.43	0.077	49.73 $\pm$ 5.77	0.431
Bachelor's degree	41.64 $\pm$ 7.12		49.98 $\pm$ 5.39	
Post graduate degree	42.96 $\pm$ 6.75		49.98 $\pm$ 5.61	
<b>Occupation</b>				
Governmental employee	42.10 $\pm$ 7.22	0.929	50.17 $\pm$ 5.94	0.504
Private sector	42.02 $\pm$ 6.76		50.27 $\pm$ 5.76	
Self employed	42.49 $\pm$ 7.64		50.06 $\pm$ 5.59	
Not employed	42.06 $\pm$ 6.52		49.63 $\pm$ 5.33	
<b>Marital status</b>				
Single	41.62 $\pm$ 6.67	0.277	49.01 $\pm$ 5.61	<0.001
Married	42.36 $\pm$ 7.01		50.61 $\pm$ 5.82	
Divorced/widow	42.35 $\pm$ 6.45		49.64 $\pm$ 5.64	
<b>House crowding index</b>				
0-1.0 high	42.54 $\pm$ 6.38	0.767	50.93 $\pm$ 5.13	0.014
1.1-2.0 middle	41.86 $\pm$ 7.13		49.68 $\pm$ 5.79	
>2.0 low	42.11 $\pm$ 6.71		49.69 $\pm$ 5.57	
<b>Source of Covid-19 information</b>				
Social media	42.19 $\pm$ 6.63	0.363	49.91 $\pm$ 5.49	0.231
MOH	41.85 $\pm$ 7.02		50.60 $\pm$ 5.60	
Television	43.10 $\pm$ 8.94		49.78 $\pm$ 7.06	
Friends or relatives	40.82 $\pm$ 7.20		49.00 $\pm$ 5.81	
<b>The time spent for Covid- 19 news /day</b>				
1min-30min	42.16 $\pm$ 6.54	0.031	49.78 $\pm$ 5.21	<0.001
30mn-1h	43.38 $\pm$ 8.29		51.87 $\pm$ 6.40	
>1h	42.14 $\pm$ 7.91		51.04 $\pm$ 6.52	
No	40.74 $\pm$ 6.38		48.88 $\pm$ 5.85	

\*SD: Standard deviation

ANOVA test was used to compare the mean knowledge score between different demographic groups

Table 4 displays the statistics related to the belief and acceptance of Covid-19 vaccines by asking respondents



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“make your opinion for people who may or may not be eligible for taking the Covid-19 vaccine?”, we noted that the respondents had a fair and clear idea of the eligibility of the different target groups for vaccination. Indeed, three-quarters of them were aware of the eligibility of adults over 65 years (74.7%), 65.6% for adults over 18 years and 61.3% for patients with comorbidities such as hypertension, diabetes and heart disease. However, only half of them were conscious of the eligibility of the vaccine for cured Covid-19 patients

and immunocompromised people. In addition, we noted that 60.6% and 58.8% respectively of respondents did not support the eligibility of the covid-19 vaccine in children under 5 years of age and in people with active disease. In addition, we noted that information from the MOH, social media (WhatsApp, Facebook), and spending more than an hour to obtain this information, were the most important factors influencing the perception of positive beliefs about the COVID 19 vaccine (Table5).

**Table 4: Beliefs and perception of Covid -19 vaccine among participants**

Make your opinion for people who may or may not be eligible for taking Covid19 vaccine	Eligible	Not eligible	Don't know
	n (%)	n (%)	n (%)
Adults ≥ 65 years	715 (74.7)	98 (10.2)	144 (15)
Adults ≥18 years	628 (65.6)	163 (17.0)	166 (17.3)
Children and adolescents <18 years	366 (38.2)	343(35.8)	248 (25.9)
Infants <5 years	73 (7.6)	580 (60.6)	304 (31.8)
Pregnant women and lactating mothers	373 (39.0)	284 (29.7)	300 (31.3)
Persons with chronic disease*	587 (61.3)	150 (15.7)	220 (23.0)
Persons with active Covid-19 infection	172 (18.0)	563 (58.8)	222 (23.2)
Persons recovered from Covid19	484 (50.6)	250 (26.1)	223 (23.3)
Persons allergic to food or drugs	210 (21.9)	323 (33.8)	424 (44.3)
Immunocompromise patients	494 (51.6)	174 (18.2)	289 (30.2)

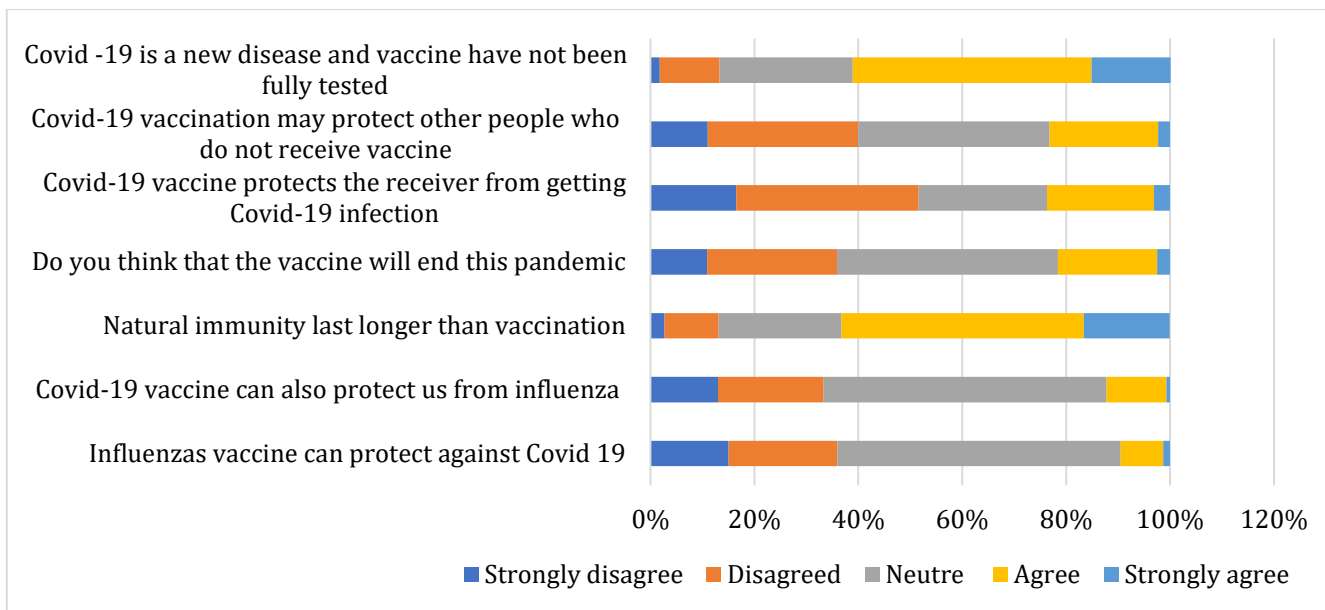
\*Persons with chronic disease: Diabetes, hypertension and heart diseases

**Table 5: Multiple linear logistic regression on factors associated with average knowledge, favorable attitude and good beliefs perception of covid-19 and its vaccine among the general population of Gaza strip**

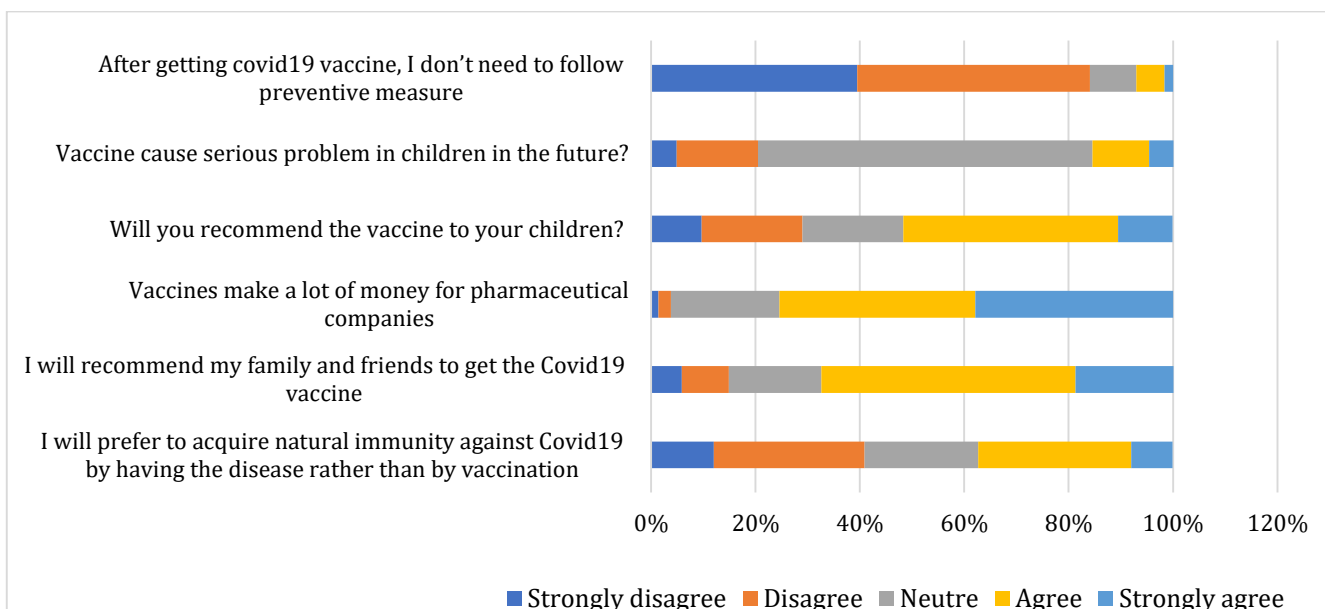
Characteristics	Knowledge	Attitudes	Beliefs
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender			
Male	1.2 (0.80-1.25)	0.5 (0.18-1.25)	1.2 (0.95-1.63)
Female	Ref	Ref	Ref
Locality of residence			
Gaza+ North Gaza	1.6 (1.15-2.29) *	1.9 (0.73-5.01)	0.9 (0.64-1.13)
South Gaza	Ref	Ref	Ref
Source of Covid-19 information			
Social media	1.3 (0.71-2.71)	4.8 (1.23-18.48) *	2.1 (1.12-4.23) *
MOH	1.1 (0.53-2.29)	2.7 (0.59-12.56)	3.0 (1.47-6.21) *
Television	1.4 (0.48-3.81)	1.1 (0.18-7.06)	2.1 (0.82-5.22)
Friends or relatives	Ref	Ref	Ref
The time spent for Covid- 19 news /day			
1min-30min	1.4 (0.85-2.14)	2.1 (0.63-6.89)	1.8 (1.16-2.71) *
30mn-1h	1.2 (0.61-2.28)	1.4 (0.26-7.98)	2.5 (1.42-4.35) *
>1h	0.9 (0.49-1.84)	1.2(0.21-6.67)	3.0 (1.39-4.47) *
No	Ref	Ref	Ref
Comorbidities			
Yes	0.7 (0.27-1.86)	5.7 (1.57-20.81) *	0.6 (0.29-1.10)
No	Ref	Ref	Ref

\*p.value <0.005; Ref: reference

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**Figure 2: Knowledge related to Covid- 19 and its vaccine among general population of Gaza strip**



**Figure3: Attitude towards Covid- 19 and its vaccine among general population of Gaza strip**

**5. DISCUSSION**

In the present study, the total knowledge score towards Covid- 19 and its vaccine was 42.14% which was unexpected in this epidemiological study conducted during the advanced stage of the pandemic. We demonstrated that about 8 in 10 of the respondents had average knowledge about Covid-19 and its vaccine. The poor knowledge was 17,8% this is less than reported in a study in Malaysia (62%) [14]. The level of knowledge was similar irrespective of age, gender, academic qualification or profession. A study done in Indonesia reported this concern [15]. On the other hand age, gender and employment status were found to be significant predictors in the study conducted in Jordan[16]. Although in this serious situation and since the announcement of the tree offered vaccines by Pfizer, Sputnik and Moderna, the Palestinian authorities are making great efforts through various

information channels and health ministry hotlines. A remarkable proportion of the population receives this information through social media such as WhatsApp and Facebook (69.6%) which was greater than the result found in the general population of India (55%)[17]. Previous studies have shown that mass media use can have a positive impact on health risk behaviors in the community [18]. The validated health information shared in social media allows for rapid and effective dissemination of knowledge [19]. Also, 98% of participants reported a favorable score toward a vaccine, which was greater than the results found in south India [20]. Regression analysis identified the factors influencing attitude towards Covid-19 vaccine, respondents who follow the media or with comorbidities were 5 times more likely to have favorable attitude, this result was consistent with a study conducted in Arab countries [21]



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Self-protection and the desire to protect family, friends, and patients were the driving forces behind people's decision to be vaccinated (35.5%). Similarly in Indonesia, the desire to protect the family has been mentioned as a reason to get a vaccine [15]. We also noted in our study the relatively high level of awareness of vaccination eligibility for all persons at risk (81.5%). This has also been mentioned by a study in Palestine which showed that participants residing in the west bank demonstrated to be more aware of the risk group when compared to those residing in the Gaza strip [22] also it was higher than the data found in India (8.8%)[17]. In public health, vaccination is one of the most important advances. It has been the origin of the control of certain infectious diseases in many parts of the world[23,24]. As a part of this survey, the first dose vaccination rate was 27.0% in our population this is less than cited by a study in china [25]. Almost half of the population receives at least 2 doses of vaccination and considered fully vaccinated, this is inconsistent with other data found in studies conducted in India (80%, and 86.3%)[26,27], South Africa (64%), France (59%)[28]. This low rate of vaccination may be explained by the harm of social networks and the spread of misinformation and rumors such as doubt of safety, raging new covi19 variants, vaccine type, and the presence of 66.8% of participants who may do not have enough time to read or receive information (1min-30min), which can influence the decision to get vaccinated. In terms of gender, our results were similar to other studies, and we observed that men were more knowledgeable about Covid- 19 vaccine compared to women [29,30], this may be due to an increase risk perception of the disease in men compared to women.

### 6. LIMITATIONS AND STRENGTHS OF THE STUDY

Our study has some limitations. Firstly, no standardized tool for assessing KAPs (knowledge, attitude and beliefs) on the Covid-19 vaccine has been previously validated. We have however adopted and modified a previously published tool for assessment. Secondly, our study is that a convenience sample via the online questionnaire service platform was conducted, and the numbers of participants from certain age groups and some occupations were lower, which may lead to selection bias and questionable representativeness. Thirdly, in this survey, a third of the participants had received education in secondary school or below, it is possible that they could not understand the questions in the questionnaire, which could increase information bias. Also, we described an observational cross-sectional design study, therefore there was no possibility of determining direct causation between our strategies and the decrease of vaccination rate. However, the strength of our study was the high participation rate.

### 7. CONCLUSION

Based on the results of our survey, a more targeted strategy involving national and international organizations, health

education, and the use of an incentive policy Offer direct protection for vaccinated individuals and contributes indirectly to herd immunity by slowing the transmission, reducing hospitalizations and deaths.

### 8. ACKNOWLEDGEMENTS

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### 9. DECLARATION OF COMPETING INTEREST

The authors declare any financial interest or any conflict of interest

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