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The Health Belief Model Perspective of Perceived Facilitators and Barriers of COVID-19 Vaccine Hesitancy

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ABSTRACT

This study examined COVID-19 vaccine hesitancy through the lens of the Health Belief Model, focusing on perceived barriers and facilitators to vaccination. The study included 380 individuals aged 18 to 60 years, selected through convenience sampling. Data were collected using a self-administered questionnaire and analyzed with SPSS. Of the 373 participants included in the final analysis, all were male, with 33.1% identifying as female and 66.9% as male, suggesting a possible reporting or sampling inconsistency. Educational backgrounds varied, with 4.8% being illiterate, 4.3% having completed primary education, 24.4% holding a graduate degree, and 41.0% possessing a postgraduate qualification. Vaccine hesitancy was relatively low, reported by only 10.8% of respondents. In terms of perceived susceptibility, nearly half of the participants felt vulnerable to contracting COVID-19 in the future. Regarding perceived severity, 57.9% believed COVID-19 to be harmful, and 66.2% viewed it as life-threatening. As for perceived benefits, 73.7% believed the vaccine could protect them from infection, and 67% felt it was also safe for their family members. These findings suggest that overall vaccine hesitancy was minimal in the study population, with most individuals recognizing both the severity of COVID-19 and the benefits of vaccination

Keywords: Covid-19, Vaccine Hesitancy, Vaccination, Perceived Severity, Perceived Susceptibility, Perceived Barriers.

1. INTRODUCTION

During the recent COVID-19 pandemic, vaccination emerged as a key intervention to combat COVID-19. As of 2 January, a total of nearly 289 million cases and just over 5.4 million deaths have been reported globally (World Health Organization, 2022). In the absence of any effective treatment, the COVID-19 vaccine emerged as the most effective strategy to combat the pandemic, which devastated the healthcare system across the globe (Mahmud et al., 2021). However, with the advancement on the vaccine development front, there emerged public concerns regarding the safety of the covid vaccine itself when in february 2021, in China, the vaccine was not recommended suitable for immunocompromized patients, pregnant and lactating females, and individulas suffering from cancers and other chrinoc diseases (Expert, 2021).

In Pakistan, vaccination campaigns have always faced challenges. The unsuccessful attempts to eradicate polio were subjected to diverse factors ranging from illetracy, lack of awareness, logistic issues in difficult terrains, law and order situation to consipiracy theories (Lazarus et al., 2020). Despite the health benefits of vaccine, general population still remaied skeptical about covid vaccine safety, efficacy, and even necessity to get vaccinated. Across the globe, the studies are conducted regarding factors effecting covid-19 vaccination and highlighted diverse personal, social, psychosocial, economical and cultural factors impacting even the willingness to get vaccinated (Neumann et al., 2020) (Guidry et al., 2021). The plethora of covid-19 related research still couldn't satisfy the concerns of many effected by conspiracy theories and less awareness especially in Pakistan where the lack of quality logical research is always an issue despite the commendable efforts from government to vaccinate majority of the population free of cost. As per the findings of study conducted in Bangladesh and Saudi Arabia, despite being willing to get vaccinated, people tend to delay vaccination for being uncertain about safety (Mahmud et al., 2021) (Al-Mohaithef et al., 2020).

In recent times, to give a more logical explanation of intent to get vaccinated, impacted by several factors, the theory of planned behaviors (Sherman, 2021), diffusion of innovation theory (Mo et al., 2021), and the health belief model were commonly incorporated in the research. in comparison to the other two models, the health belief model was developed specifically deveopled focusing on the preventive aspect of health-related related research (Coe et al., 2012) (Wong et al., 2020). The health belief model assumes that health-related behaviors and actions are largely dependent upon motivation, belief in being vulnerable and considering the any health related recommendation made will reduce the perceived threat to health (Rosenstock et al., 1988), based upon the six componenets of health belief model (Figure-1) .

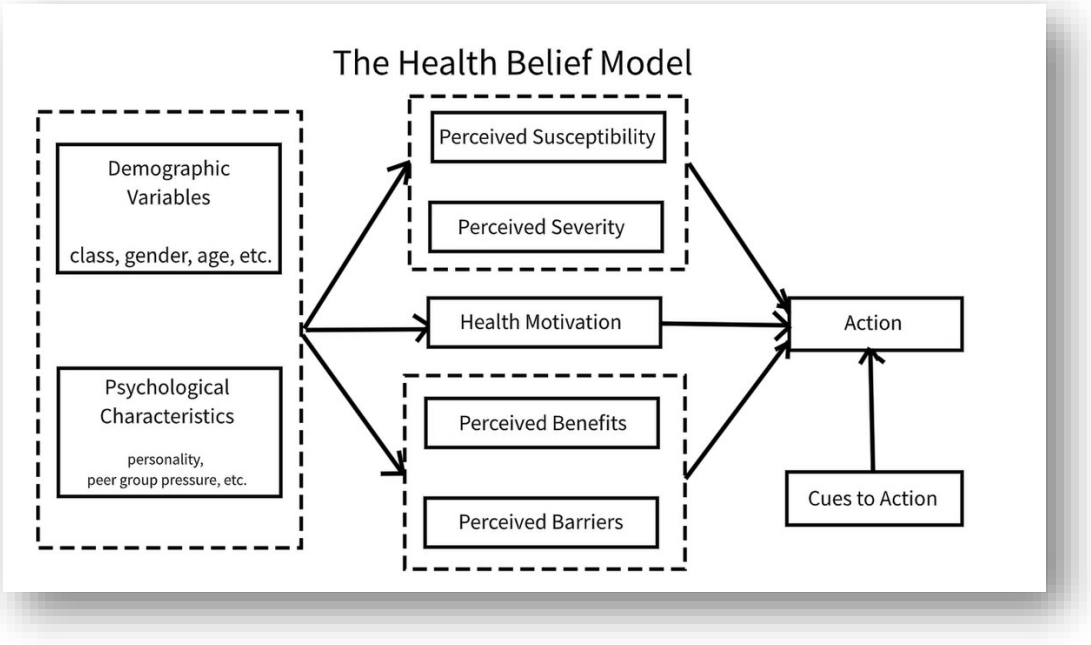

Figure 1: Health Belief Model

Considering the utility of the health belief model, it is selected for the current study. Since the issue of vaccine hesitancy prevails in Pakistan, the conspiracy theories not only mislead communities but also shake their confidence in any COVID-19 prevention efforts taken up on the national level (Jaafari, 2021) (Hadid, 2021). Khyber Pakhtunkhaw has faced major challenges in terms of health and vaccination campaign. There are certain districts still facing less vaccination rates as compared to others and where local community has varying vaccine preferences and perceptions. For this reason, this study was conceived to study the barriers and hesitancy related to covid vaccine and the determinants to vaccination rate in the light oh Health Belief Model.

It is defined as that the vaccine hesitancy refers to "delay in acceptance or refusal of vaccines despite availability of vaccination services". While, the vaccine facilators is the factors that contribute to the acceptance of vaccine or urge the individual to get it done on priority basis. Vaccine facilitators will be assessed on the basis of two questions related to

perceived benefits with yes or no response (Chen et al., 2021). Furhermore, that vaccine barrier is any factor that prevents or hinders any individuals from getting vaccnation. The perceived barriers to vaccination will be assessed on the basis of six questions of perceived barriers having yes or no response.

2. REVIEW OF LITERATURE

2.1 Health Belief Model

The HBM was developed to test an individual's behavior and decisions regarding preventive medicine, rather than an individual's decision to accept treatment after receiving a diagnosis. Hochbaum (1958) researched the relationship between an individual's beliefs and participation in a public tuberculosis screening program offering x-rays. He used constructs that would eventually comprise the HBM: psychological readiness (self-efficacy), belief in possibility of contracting tuberculosis (perceived susceptibility), belief in benefits of early diagnosis (perceived benefits), and situational factors (perceived barriers and cues to action). This was a major breakthrough for the effective utilization of model for tuberculosis program. It later stagged the medium for the future research to understand the utilization of model for various behavioral interventions.

Rosenstock et al., (1960) studied why individuals were not getting poliomyelitis vaccines. Within this study, the constructs that would become the HBM were further developed. Rosenstock (1966) looked at 5 perceived susceptibility, perceived seriousness, safety and effectiveness of the vaccine (perceived benefits), and social and situational factors including social pressures (cues to action) and convenience (perceived barriers). Rosenstock (1974) mentioned the prompts which were in place to alert individuals to take action regarding the poliomyelitis vaccine were targeted toward higher income and higher educated individuals. He expressed concerns that those of lower economic status and education possibly had not seen the ads and, if they had, could not comprehend them. To further this development of HBM, Lewin (1935) reflected on how motivation impacts public health use and proposed three principles of motivation. The first is that preventive behavior is defined by the perceived susceptibility, perceived severity, and perceived benefits. Second, action rises from conflict between motives and various behaviors. Third, health-related motives do not always lead to health-related behavior, and vice versa. Rosenstock acknowledged the origin of the HBM within his study that explored individual behavior concerning public health services. The HBM evolved through several studies that sought to understand preventive health behavior. The constructs which are both cognitive and emotional are derived from an individual's subjective world rather than the objective world of their physician. Rosenstock discussed that three areas must be satisfied for action to be taken:

1) The individual must be psychologically ready (perceived susceptibility and severity);

2) The individual must believe that the preventive action is achievable or will reduce the severity and/or susceptibility of a condition and has no psychological barriers (perceived benefits and barriers); and 3) a stimulus must trigger the action (cues to action).

Rosenstock admits 6 that the HBM ideas were drawn from general socio-psychological theories, in particular Lewin's theory of goal setting and level-of-aspiration situatio (Lewin, 1935). Maiman and Becker (1974) compared the HBM to six other psychological theories, including Lewin. As suggested by Lewin, they concluded that an individual's behavior depends ultimately on the value they place on the outcome and the estimate that the outcome can be achieved. The achievement of an outcome is perceived as more attractive when there is hard work needed to accomplish success.

2.2 Covid-19 Vaccine & Health Belief Model (HBM):

To prevent the spread of disease, mortality, morbidity, and case fatality Covid-19 vaccine was the only efficient approach (Waxman, 2022) (Marfe et al., 2021). The health belief model (HBM) was one of the most useful models to understand the facilitators and barriers of the covid-19 vaccine hesitancy (Mercadante, 2021). The HBM, elaborate on different human nature and intentions of the public to receive the vaccination (Al-Metwali et al., 2021). In many previous studies of infectious diseases, the health belief model was an important prognosticator of vaccination uptake (Fall et al., 2018).
The health belief model consists of important components mentioned below in Figure 1, to be present in people's behavior and actions, such as modifying variables, perceived seriousness, perceived susceptibility, perceived benefits, perceived barriers, perceived threat, self-efficacy, and cues of action and health-promoting behaviour.

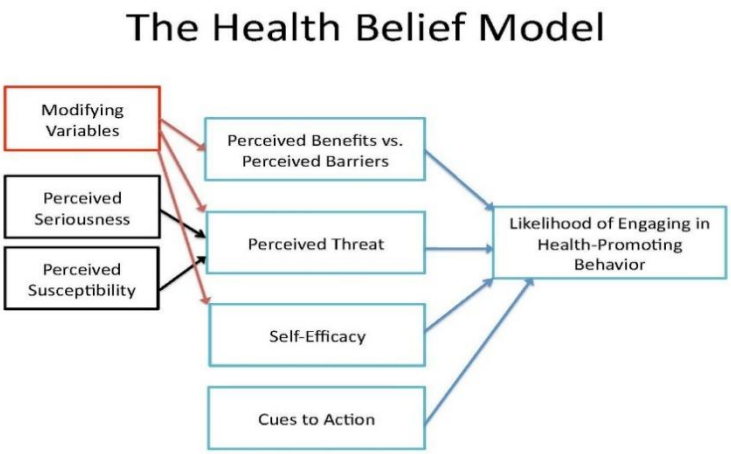

Figure 1: Health Belief Model

One study was conducted in China using the HBM on vaccine hesitancy; in which they found that a higher range of the population was willing to receive a vaccine and were significant predictors of vaccination (Shmueli, 2021). On the other side, a considerable range of the population was worried about the fake vaccine; and they were not significant predictors of vaccination. This study concluded that it was necessary to reduce the barriers and promote the facilitators of Covid-19 vaccination, to control the spread of the disease (Lin et al., 2020).

2.3 Perceived Barriers

The World Health Organization's, experts according to the definition of vaccine hesitancy and previous immunization experiences innate "3Cs" model for vaccine hesitancy, which consists of Complacency, Confidence and Convenience (Wang et al., 2021). In Complacency, other health issues are more important and priority than the vaccine. Confidence means that there is very less trust in vaccines, which can be due to less trust in the health system or vaccination centers or vaccine delivery systems. Convenience means there can be barriers related to the availability of vaccines, accessibility to vaccine centers and may be compromised quality of services given.

Many research studies' experiences from past infectious outbreaks and their immunization system and barriers which interfere with vaccine uptake can be seen. They have divided barriers into two categories: Structural barriers (that is Physical access to vaccine, Transport charges, Job flexibility- cannot take off to take the family for vaccination, Supply interruptions such as distribution and delivery of vaccine and its production) and Attitude-related barriers (that is Less trust in the healthcare system or the efficiency of vaccines, or in companies that produce vaccines, Misunderstandings, myths, and rumors create fear about the uncertainty of the vaccine, Lack of knowledge and awareness about the vaccine, Past bad experiences or trauma about vaccination, and Peers influence).

Similarly, many studies concluded that addressing the structural and attitude-related barriers can improve the intake of Covid-19 vaccination in different populations. The government of the country invested to ensure that vaccines should be received free of cost to everyone equally. However, in some situations paying out-of-pocket expenditure for the vaccine still came the notice. Different awareness programs and seminars were arranged by the government to close the information gaps about the vaccine in public.

2.4 Perceived Facilitators

The most important and effective facilitator for vaccination is a positive attitude towards a vaccine (Greyling and Rossouw, 2022) (Kumari et al., 2021). This will give favorable outcomes for the receiving of the Covid-19 vaccine. The benefits identified for receiving the vaccination are: Accessibility of individual to vaccine and Psychological and physical wellbeing. People also claimed that the pandemic disturbed their life routine like lockdown brought depression, and anxiety, wearing a mask was compulsory and home quarantine (Emily et al., 2021) (Mental health Covid-19, 2020). However, if the maximum population receive the Covid-19 vaccine spread of the disease can be controlled and everyone can return to their normal life as it was before the pandemic.

According to Mertens et al., (2022), people perceived that taking the vaccination for Covid-19 can manage their fears and high levels of stress. Participants in this study shared those vaccines would be the remedy to their mental stress and will assure them of safety against the virus. In another study, it was mentioned that maximum vaccination would reduce the

disease burden along with the financial expenses.

The most important facilitator of the Covid-19 vaccine is the influence of social circle; participants who are given support from family, parents, children, and spouses are more prone to accept the vaccine intake. They are motivated by society for vaccination. Another important role is played by health facilitators, doctors, or health care workers who are trusted in the community and can easily convince the public to vaccination. People listen to them carefully and trust them. Communicating the benefits of vaccines through stakeholders and media can increase the uptake.

2.5 Health Promoting Behaviors

Health-promoting behaviour is the action taken by the individual for the betterment of his or her health and would decrease the risk of disease. Health information regarding the Covid-19 vaccine would help to control the spread of disease in the population (Elhadi et al., 2021). Five stages of behaviour change are advocacy, practice, intention, approval and knowledge (Ababu et al., 2017).

There are different methods to promote healthy behaviour, for example, media attention or interpersonal interactions can influence individuals indirectly for vaccination. In the two-step process model, it is mentioned that communication intervention or cognitive beliefs, can consequently cause behaviour change.

The significant source of information regarding the covid-19 vaccination was newspapers, social media, television, search engines, non-governmental websites and friends and family (Purvis et al., 2021). All the sources of information vary according to their accessibility and reliability. Much evidence-based research studies that the reliance of individuals on different sources of information regarding the Covid-19 vaccination would be significant and, in another way, would influence their health beliefs and behaviour toward taking the vaccine (Syed et al., 2021).

3. METHODOLOGY

The study was conducted in the district of Mohmand Agency, Khyber Pakhtunkhwa, Pakistan. It will use the inductive method and descriptive statistics.

3.1 Sampling Technique and Sample Size

The convenience sampling technique used for the recruitment of the required sample. Similarly, for the sample size of this research, the open-EPI sample size calculator, considering 95% Confidence interval, 5% absolute precision and 44.3% vaccine hesitant participants 17, the sample for this study was 380. Furthermore, inclusion and exclusion criteria were set aside for sample selection.

3.1.1 Inclusion Criteria

- Males and females aged 18 – 60 years, residents of Mohmand Agency, were included in this study.
- Individuals not suffering from any mental impairments

3.1.2 Exclusion Criteria

- Age less than 18 years
- Individuals not residents of Mohmand agency
- Individuals already vaccinated with Covid-19 vaccine

3.2 Tools of Data Collection

The first-hand data were collected through a questionnaire. The questionnaire for this study comprised three sections. The first section regarding the socio-demographic and health-related details of the participants. The second section dealt with vaccine hesitancy and vaccination status (2-items). Items for health belief model and external cues to action were derived from the study conducted by Chen et al., (2021).

4. RESULT AND DISCUSSION

Descriptive statistics used for data analysis, specifically mean, standard deviation, frequencies, and percentages, were calculated using SPSS version 24. The prevalence and 95% confidence interval of vaccine hesitancy and vaccination was determined as per the study participant's socio-dempgraphic and health related characteristics and health belief model factors. This section presents and interprets the key findings of the study, focusing on the perceived facilitators and barriers to COVID-19 vaccination through the lens of the Health Belief Model (HBM). The analysis is based on the responses of 373 participants, after exclusion of incomplete questionnaires. The results are structured to align with the core constructs of the HBM, namely perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy.

4.1 Demographic Analysis

The demographic profile of participants is examined to identify patterns or associations that may influence vaccine hesitancy. The integration of both quantitative data and theoretical framework offers a comprehensive understanding of the complex factors driving vaccine-related attitudes and behaviours within the study population. In this section, the socio demographic characteristics of the study participants are presented. A total of 382 participants were recruited for final data collection, however after the scrutiny of filled questionnaire, 9 were discarded for incomplete data so for the analysis, 373 responses were included. The demographic characteristic of any research population represents the identifying factors on which it is decided whether there are according to selection criteria or not.

In table no 4.1, mean age of the study participants, monthly income, and average number of people in the household is presented. The mean age of the 373 study participants was 34.27 ±5.88 years. The average monthly income of the participants was 30207.64 rupees. The average number of the people living in the households of the study participants was 7.95 ±3.49.

Table 4. 1: Demographic Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
age of participants	373	23	51	34.27	5.898
Monthly Income	373	8000	400000	30207.64	25757.619
No of people in the Household	373	2	21	7.95	3.492

4.2 Assessment of Socio-demographic and Education Variable

Surprisingly, all the participants were males as considering the cultural and social norms, no female participated in the study, the frequency of male is 373.

For the educational status of the participants, 4.8% of the participants were illiterate, 4.3% had primary level education, 10.7% had middle education, and 24.4% had acquired matric level education. The graduate and post graduate level education was acquired by 41% and 14.2% participants respectively as projected in table4.2.

Table 4.2 Educational Status of the Participants

Education Status	Frequency	Percent
Illiterate	18	4.8%
Primary	16	4.3%
Middle	40	10.7%
Matric	91	24.4%
Graduate	153	41.0%
Postgraduates	53	14.2%

Similarly, the occupational status of the study participants was assessed for being government servants, private employment and self-employed. Of the study participants, 15.8% were government employed, 33.5% were private employees and 50.7% were self-employed as projected in table 4.3.

Table 4.3 Employment Status of the Participants

Employment Status	Frequency	Percent
Government	59	15.8%
Private	125	33.5%
Self employed	189	50.7%
Total	373	100.0%

4.3 Assessment of Health-Related Variables

This section present the data regarding health-related variables of the study participants.

4.3.1 Family member with medical background

Table 4.4 is showing the data regarding having any family member in the family with medical background. This variable holds importance as having family member with medical background impacts the decision to get vaccinated. As per the data 43.4% participants had family member with medical background.

Table 4.4 Any Family Member with Medical Background

Family medical background	Frequency	Percent
No	211	56.6%
Yes	162	43.4%
Total	373	100.0%

4.3.2 Self-Reported health status

The data regarding self-reported health status is presented in table 4.6 of the total, 99.2% reported good health status and only 0.8% labelled their health status at moderate level.

Table 4.5 Self-Reported Health Status

Health Status	Frequency	Percent
Good	370	99.2%
Moderate	3	0.8%
Total	373	100.0%

4.3.3 COVID-19 Vaccination status

Considering the pandemic Covid-19 and the precautionary measures recommended by the health authorities, vaccination is only prevention against the corona virus. From the collected data is identified that 89.3% had been vaccinated and 10.7% were not vaccinated.

Table 4.6 Covid-19 Vaccination Status

Vaccination Status	Frequency	Percent
No	40	10.7%
Yes	333	89.3%
Total	373	100.0%

4.4 Covid-19 Vaccine Hesitancy:

Among the important constructs of the health belief model is the hesitancy. The Covid-19 vaccine hesitancy endorsed the data of vaccination status as the 89.3% still reported their willingness to get vaccinated, similarly, 3.8% were not willing to get vaccinated and 7.0% were still not sure if they will get vaccinated or not. The Covid-19 vaccine hesitancy status are shown in the following table 4.7

Table 4.7 Covid-19 Vaccine Hesitancy Status

Vaccine Hesitancy Status	Frequency	Percent
I am willing to get vaccinated	333	89.3%
Not Sure	26	7.0%
Not Willing	14	3.8%
Total	373	100.0%

4.5 Perceived Susceptibility to COVID-19

In the construct of health belief model is the perceived susceptibility as this is the behavior which leads to the informed decision making. This part comprised three questions to determine the perceived susceptibility considering their past, present, and future perception of the situation.

From the collected data information it is identified that 69.7% of the participants reported to be perceiving themselves as being vulnerable to getting infected with the Covid-19, while 30.3% reported that they are not. The vulnerability to infection of Covid-19 shown in Table 4.8.

Table 4.9 vulnerability to infection with Covid-19

Vulnerability to infection	Frequency	Percent
No	113	30.3%
Yes	260	69.7%
Total	373	100.0%

Furthermore it is identified that 50.4% of the total considering themselves as vulnerable to get infected with Covid-19, while 49.6 % did not find themselves as vulnerable, data shown in Table 4.9.

Table 4.9 Still vulnerable to infection with Covid-19

	Frequency	Percent
No	185	49.6%
Yes	188	50.4.%
Total	373	100.0%

4.6 Perceived Severity of COVID-19 Infection

Perceived severity in the health belief model is major element to identify if the individual with get compelled to a certain protective practice like getting vaccinated. In this study, for the perceived severity, three domains were inquired. A questions answered by respondents that “if it would be harmful if they get covid-19 vaccine? From the collected data it is identified that 57.9% answered that it is harmful for them to get infection while 42.09% answered that it is not harmful for them to get infection with Covid-19 vaccine, are shown in table 4.11.

Table 4.11: Harmful for them to get infected with Covid-19

	Frequency	Percent
No	157	42.09%
Yes	216	57.9%
Total	373	100.0

4.6.1 Covid-19 is life threatening

Another aspect of perceived severity is considering the situation being life threatening. For this reason, and among the study participants, 66.2% considered covid life threatening for them and 33.8% did not consider it life threatening as presented in table 4.12.

Table 4.12 Covid-19 is life threatening

	Frequency	Percent
No	126	33.8%
Yes	247	66.2%
Total	373	100.0%

Covid-19 emerged as a potential threat to life and for this reason one element evaluating the perceived severity is considering the condition as potential cause of death or leading to death. It is identified that 19.8% of the respondents considered that they can die from Covid-19 vaccine anytime, however 80.2% of respondents perceived that they cannot die of Covid-19 vaccine the table 4.13 shown that about either the respondent can die from Covid-19 vaccine or not.

Table 4.13 either the respondent can die of covid-19 anytime

	Frequency	Percent
No	299	80.2%
Yes	74	19.8%
Total	373	100.0%

4.7 Perceived Benefits of COVID-19 Vaccination

Benefits perception leads to an informed decision making and selecting the desired benefit. In this study it is identified from the collected data that 73.7% of the respondents perceived that Covid-19 vaccine can protect them from the infection with SARC-CoV-2, while 26.3% of the respondents say that they were not protected by the infection of SARC-Cov-2 vaccine, shown in table 4.14.

Table 4.1: COVID-19 vaccination can protect from infection with SARS-CoV-2

	Frequency	Percent
No	98	26.3%
Yes	275	73.7%
Total	373	100.0%

Furthermore, the perceiving benefit is that whether the participant perceives benefits for themselves or for whole family. Because there might be situation where they do not feel something equally beneficial for their family members. From the collected data 67% respondent's responses that they considered the vaccine can help keeping their families safe, while 33% did not consider it safe for their families as well, it is shown in the table 4.15.

Table 4.16: Covid-19 Vaccine keeping family members safe

	Frequency	Percent
No	123	33.0%
Yes	250	67.0%
Total	373	100.0%

4.8 Perceived Barriers To Covid-19 Vaccination:

Barriers are major contributing factor to hinder in getting the treatment or practices designed for the purpose of their health benefits and improvement. The table 4.16 shows that 71.3% of the respondents responded that the vaccine having did not any side effects. While, 28.7% of the respondents says they feel side effect regarding Covid-19 vaccine.

4.16: Perception regarding Covid-19 vaccine side effects

	Frequency	Percent
No	266	71.3%
Yes	107	28.7%
Total	373	100.0%

Similarly, with all the vaccinations, the conspiracy theories cannot be ignored. When inquired about the Covid-19 vaccine causing any infertility to the participants or their family based on their perception. From the collected 16.1% of the respondent show his perception about Covid-19 vaccine that the vaccine can cause infertility, while 83.9% respondents did not perceive vaccine to be causing any infertility as shown in table 4.17.

Table 4.17 Perception Regarding Covid-19 Vaccine Causing Infertility

	Frequency	Percent
No	313	83.9%
Yes	60	16.1%
Total	373	100.0%

Additionally, with the emergence of the Covid-19 pandemic, the initial response of lay people towards it was of a propaganda. Such infodemic and misinformation can contribute to the barriers towards positive health seeking. Table 4.18 shows that 31.1% of the respondents considered it all propaganda while 68.9% respondents perceive that Covid-19 vaccine are not a propaganda.

Table 4.18 Propaganda Perception about Covid-19 Vaccine

	Frequency	Percent
No	257	68.9%
Yes	116	31.1%
Total	373	100.0%

Furthermore, the table 4.19 represents the data regarding the participants' perception of effectivity of Covid-19 vaccine. During the data collection a question asked from the respondents is the Covid-19 vaccine is effective? Then the 25.2% respondents answered it effective while the 74.8% says that the vaccine of Covid-19 did not have any effectiveness.

Table 4.20: Perception about effectiveness of Covid-19 vaccine

	Frequency	Percent
No	279	74.8%
Yes	94	25.2%
Total	373	100.0%

Surprisingly, when participants were inquired about the people in the social circle or surroundings of the participants in the favor of Covid-19 vaccine, there was not much difference between the Yes or No categories. From the table 4.20. The 49.6% respondents responded that they not face any favour of Covid-19 vaccine, while 50.4% responded that they and the people around them were in favour of vaccine which is a negligible difference and can impact the decision regarding vaccine acceptance or hesitancy about Covid-19 vaccine.

Table 4.20 People in Favour of Covid-19 Vaccine

	Frequency	Percent
No	185	49.6%
Yes	188	50.4%
Total	373	100.0%

Additionally, about the knowledge about vaccine were identified in the research area. From all the respondents question asked whether they have knowledge about vaccine or not, about half of them answered that they have knowledge about Covid-19 vaccine while the other answered they have not any knowledge about vaccine. The Table 4.21 shows that 55.7% respondents answered that they have not enough knowledge about the vaccine. Similarly, 44.2% of the respondents responded that they have knowledge about vaccine. This variable is again critical as lack of knowledge can contribute as major barrier to vaccine acceptance among masses and common people.

Table 4.21 Knowledge about Covid-19 Vaccine

	Frequency	Percent
No	165	44.2%
Yes	208	55.7%
Total	373	100.0%

4.9 Self-Efficacy for COVID-19 Vaccination

Self-efficacy is the important element of the vaccination. It ensures that an individual is ready to accept the vaccine for their betterment with full determination. When our study participants were inquired about if they can deal with the side effects of the Covid-19 vaccine with doctor's help, then 62.2% responded to deal with it and 37.8% believed that they cannot deal with it even with doctor's help as mentioned in table 4.22

Table 4.22: I believe I can deal with side effects of the COVID-19 vaccine with doctors' help

	Frequency	**Percent**
No	141	37.8%
Yes	232	62.2%
Total	373	100.0%

5. CONCLUSION

Health belief model is a perfect construct to explore and evaluate people's perception of a health threat and their likely actions to overcome that threat and accept or reject the potential treatment or intervention. Based upon our current study's result, the vaccine hesitancy was only 10.8% among the study participants but there were factors associated to create uncertainty or barrier to vaccine hesitancy.

Vaccine hesitancy as reported at different waves has different outcomes. Since our current study, the overall vaccine hesitancy was 10.8% which is quite low as compared to those reported in previously conducted studies. The findings of a previously conducted study report that over all vaccine hesitancy was 44.3% (Chen et al., 2021). Even in a previously conducted global survey, vaccine hesitancy was over 50% which is quite high than that reported in our study (Lazarus et al., 2021). Similarly, in previously conducted studies, females were found to be more vaccine hesitant considering the side effects of vaccine (Freed et al., 2009) but since our study, unfortunately no female participated so getting their perception was a missed element and men are already reported to adhere to more acceptance of vaccines even in previously conducted studies (Moran and Dell, 2016).

Vaccine hesitancy is not a standalone process rather an amalgamation of different constructs of health belief model which compels or restricts an individual towards certain health seeking behaviour. Previously published literature does support the effective utilization of this model to study vaccine hesitancy (Karafillakis & Larson, 2017). Studies reported that the beliefs of any individual regarding vaccine acceptance and making decisions to get vaccinated are affected by perceived benefits in health belief model (Karlsson et al., 2020). Based on the findings of our study, there was better understanding among the participants for the perceived susceptibility and severity regarding covid-19 infections. This claim was supported by previously conducted studies where males had high level of acceptance and intent to vaccination is directly associated with HBM constructs (Sherman, 2020).

For the perceived barriers, the intent to get vaccinated is tremendously impacted by the barriers. As per the findings of our study, the perceived barriers were largely rejected supporting the low hesitancy among our study participants. Literature also supports this fact that acceptance of vaccine is more when perceived barriers are low (Zampetakis & Melas, 2021). Overcoming barriers presented higher vaccine acceptance rates in our study. Findings of previously conducted study report high vaccine acceptance among the study participants in Israel, USA and other countries (Dror et al., 2020) (Reiter et al., 2020). With the context to Pakistan, where vaccination campaigns are always a target especially polio campaign, Covid-19 vaccine also received the same criticism for being a propaganda. For this reason, initially the vaccination received extreme hesitancy (Khalid et al., 2022). Till the 2021, there was still hesitancy among the population regarding Covid-19 vaccine (Tahir et al., 2021) but government took strict actions to make everyone vaccinated. One possible reason for high rate of vaccination among our study participants might be that till the third wave due to governments actions and also among acceptance in the communities, people of all ages are now vaccinated to greater extent.

As previously mentioned in the introduction section, Health belief model assumes the health-related behaviors and actions are largely dependent upon motivation, belief of being vulnerable and considering the any health-related recommendation made will reduce the perceived threat to health[14] based upon the six components of health belief model. This claim is justified by the findings of our study when participants responded to find covid safe not only for themselves but also for the peoples living in their surroundings and family members. Based on human psychology, if they find somethings safe for themselves,

they find it equally safe for their families as well and it's a normal phenomenon. Since the covid emerged as the global pandemic of this era, the only cure was vaccination to prevent for being infected in future. The awareness of the potential threat, and severity of the symptoms associated with it compels the individuals to get vaccinated.

Based on the findings of current study, it can be confidently stated that constructs of health belief model if understood clearly against emerging health threat, the vaccine acceptance automatically increases among the masses and it in turn generates the sense of being safe for reinfections.

6.2 Limitation and Future Recommendations

This research study shares some limitations. Future researchers are recommended to address this limitation for further exploration of the matter.

1. **Limited Gender Representation**: The study did not include female participants, resulting in a lack of gender diversity and limiting the generalizability of the findings across both sexes. *Future Recommendation*: Future research should aim to include both male and female participants to provide a more balanced and comprehensive understanding of vaccine hesitancy.
2. **Geographical Scope**: The research was confined to the Mohmand Agency, which restricts the ability to generalize findings to other regions. *Future Recommendation*: Similar studies should be conducted in other districts or provinces to allow for comparative analysis and to better understand regional variations in vaccine attitudes.
3. **Basic Analytical Approach**: The study applied a general analysis based on the Health Belief Model without incorporating more complex statistical methods. *Future Recommendation*: Future research could utilize advanced statistical tools and modeling techniques to deepen the analysis of Health Belief Model constructs and improve the understanding of their influence on vaccine hesitancy.

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