

DEVELOPMENT AND VALIDATION OF COVID-19 VACCINE HESITANCY SCALE FOR GENERAL PAKISTANI POPULATION

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Abstract

The purpose of the present study is to develop and validate the COVID-19 Vaccine Hesitancy Scale through Exploratory Factor Analysis (EFA) and the resulting factors confirmed through Confirmatory Factor Analysis (CFA). The sample of EFA comprised the general population (n = 311) in which male (n = 140) and female (n = 171) ages ranged from 18 to 60 years (M= 26.38 and SD =6. 79). Factor loading of .30 was set as selection criteria of an item in the scale. Using Varimax rotation method, EFA presented five meaningful factors for COVID-19 Vaccine Hesitancy Scale and factors named as Belief in myths & conspiracy theories (14 items), Perceived effectiveness (10 items), Religiosity (4 items), Social and Media Influence (9 items), and Misinformation (5 items). For CFA sample of the general population (n = 300) in which male (n =150) and female (n =150) ages ranged from 18 to 60 years (M=24.56 and SD =4.95). Alpha reliability for the subscales of the COVID-19 Vaccine Hesitancy Scale was calculated, it was .95(Belief in myths &conspiracy theories), .92 (Perceived

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effectiveness), .61(Religiosity), .72(Social and Media Influence), .72(Misinformation). Overall COVID-19 Vaccine Hesitancy Scale developed for the general population is a reliable and valid measure to assess COVID-19 vaccine hesitancy in Pakistani culture.

Key Words: *COVID-19 Vaccine Hesitancy, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA).*

Introduction

COVID-19 was first reported in Wuhan, China, in early 2020. It is caused by SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus). Almost three years have elapsed since the first case of SARS-CoV-2 surfaced. During this period, the overall awareness and understanding regarding COVID-19 has undergone an enormous change. There initially was no approved treatment for the COVID-19 virus. This actuated an unprecedented need to create a vaccine that could be safe to administer and effective in a short period (Marti *et al.*, 2017). In a short span of time, a number of vaccines were produced by pharma industries worldwide and most of them have been found to be considered safe in all respects (Hodgson *et al.*, 2021). However, there is a flip side to these vaccination programmes as well. When all the measures at the administration level regarding mass inoculation of COVID-19 vaccines have been put in place, people or masses are required to show willingness for getting vaccinated voluntarily for achieving what is called herd immunity. However, this was found that the aim of achieving herd immunity against COVID-19 could not be materialized because of a factor called vaccine hesitancy (Ashby & Best, 2021).

Vaccine Hesitancy is the delay in acceptance or refusal of vaccination despite availability of vaccination service (WHO, 2019). The reluctance regarding vaccination is referred to as vaccination hesitancy (Garcia & Yap, 2021). Several different factors contributing to vaccine hesitancy were reported throughout the world. Conspiracy theories can be defined as attempts to explain the ultimate causes of significant social and political events and circumstances with claims of secret plots by two or more powerful actors (Douglas *et al.*, 2019). These ideas frequently surfaced during social critical situations, which were the times of increased general anxiety and despair leading to vaccine hesitancy (Paterson, 2018).

One study indicated that religious teachings value prayers above medicine, which leads to vaccination hesitation among devotees. This raises concerns about how vaccination hesitancy is represented in religion (Lucia *et al.*, 2021). Due to this and a lack of understanding about the available vaccines, devotees embrace alternate methods of treating illnesses, such as the use of holy water and prayers, out of a fear that vaccination would cause their children's deaths. Other religions, like Islam, forbid the use of vaccines containing pork by products (Machingaidze & Wiysonge, 2021). The uptake of vaccines has also been negatively impacted by religious concerns. Some religious authorities contend that vaccinations are against Shariah and are not "Halal." Additionally, there is a lot of suspicion for vaccines among groups that think that vaccines are part of a Western plot to wipe out Muslims (Perveen *et al.*, 2022). According to a Gallup Pakistan survey, of the 46% of Pakistanis who were eager to get immunized, 42% preferred not to use vaccinations developed in the West (Gallup, 2021).

Depending on how it is used, media is a weapon that can either be a blessing or a curse. Although social media is thought to be one of the most effective vehicles for mass education, it is frequently used improperly to propagate false, contradictory, and misinformation, especially during the current. Positive information about vaccine, expert opinion, recommendation by doctors, support by family or friends' group to get vaccinated can decrease vaccine hesitancy which will ultimately results in more vaccine uptake (Bertin *et al.*, 2020).

There are few scales to measure COVID-19 vaccine hesitancy, developed in different countries of world which specifically highlighted the factors responsible for vaccine hesitancy in their population. Till this date not a single scale is developed in English or Urdu to measure vaccine hesitancy of Pakistani population. A very few studies conducted to measure vaccine hesitancy of Pakistani population most of them were in English and developed by foreign authors. So, the aim of present study is to develop COVID-19 vaccine hesitancy scale for Pakistani population and sought to highlight the factors which are contributing to their temporary refusal of vaccine.

Method and Result

Present study was conducted in two phases. In phase 1 COVID-19 Vaccine Hesitancy Scale (SPSS) was developed and phase 2 dealt with establishing factorial validity and psychometric properties of the scale.

Phase 1: Development of COVID-19 Vaccine Hesitancy Scale (PSSS)

Step 1- Qualitative Exploration. In qualitative exploration five focus group discussion with university students of BS, M.Sc. and M.Phil. of different departments of university were conducted and number of participants in each

group varied from 5 to 8 individuals and four focus group discussions were conducted with people from different fields of life. Five focus group discussions were conducted with different department of Quaid- I-Azam university and one with the students of University of Gujrat, more than twenty interviews were conducted, and open-ended questions were posted on different platforms of social media (Facebook and WhatsApp) to get the information from general population on study variables.

Step-2 Generation of item pool. Along with the indigenous understanding of the phenomenon, literature on COVID-19 vaccine hesitancy was also explored. 59 Items pool for COVID-19 vaccine hesitancy were related to “Attitude towards Corona vaccine”, “Role of media”, “Role of Society”, “Belief in myths” ‘Role of Religion”, “Misinformation” and how they are reacting towards acceptance of covid-19 vaccine.

59 Item pool of 5-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly agree for COVID-19 vaccine hesitancy Scale was generated. Cumulative scoring for individual subscale was computed.

Step 3- Item Evaluation from Experts. After generation of item pool, feedback and opinions from experts were taken. Four Ph.D. scholars and four M.Phil. scholars in Psychology were contacted and requested to review each item carefully for language appropriation, overlapping, construct relevance, face validity and identify ambiguous items. After taking opinions from experts, 56 items were retained out of 59.

Phase 2 - Factor Structure and Validation of COVID-19 Vaccine Hesitancy Scale

Step 1- Exploratory Factor Analysis (EFA). In this step, factor structure and psychometric properties of COVID-19 vaccine Hesitancy Scale were determined through EFA.

Sample. A sample of 311 collected from general population ($n = 311$) in which male ($n = 140$) and female ($n = 171$) with age range of 18 to 60 years ($M = 26.38$ and $SD = 6.79$) with education of intermediate, graduates and postgraduates from Quaid- i- Azam University Islamabad, University of Gujrat. The convenient sampling technique was used for collecting data.

Procedure. General population belonging to different sectors were approached through online google form and manual questionnaires. Online google form link were send through WhatsApp's, Facebook, and instructions were given to share with their friend circle, family colleagues who are falling in the inclusion criteria set for the sample of this study. Detail about the nature, purpose and scope of the study was instructed to participants and informed consent was attached with 1st page of the data collection form those who accepted the participation will move to the next section which is the research questionnaire booklet.

Result. Principal Component Analysis with Varimax Rotation was performed to explore the factor structure of the COVID-19 Vaccine Hesitancy Scale. The number of factors determined was based on Eigen values greater than 1 and scree plot (Kim & Mueller, 1978). Value of Kaiser Myer Olkin (KMO) was .89 which indicates the sample adequacy. Bartlett test of Sphericity value was $\chi^2 = 10108.223$ significant at $p < .001$ shows correlations are enough to generate distinct and reliable factors. Initially

Principal Component Analysis was performed with six factor solutions, however ended with five meaningful factor solutions.

Table 1 shows that 42 items loaded on five factors for COVID-19 Vaccine Hesitancy Scale (CVHS) Loadings $<.30$ are suppressed. Items with $.30$ or above loading were retained and less than $.30$ loading have been excluded. Pandemic Stressor Scale explained 45 % variance and no item with reverse coding. After the EFA Item no 43, 44, 45, 46, 47, 48 were deleted after the expert opinion. Item 49, 50 and 51 were not good representative of the labelled factors. Items in five factors were labelled with the help of four research experts (Ph.D.) as Belief in myths & conspiracy theories, Perceived effectiveness, Religiosity, Social and Media Influence, and Misinformation.

Table 1

Factor loadings on a principal component's analysis with varimax rotation for Covid-19 Vaccine Hesitancy Scale (N= 311)

Items	factors				
	1	2	3	4	5
1	.85	-.17	-0.04	-.06	.04
2	.85	-.15	-.11	-.01	.08
3	.85	-.18	.01	.08	.08
4	.85	-.17	-.03	-.02	.09
5	.84	-.15	.01	.05	.10
6	.82	.00	-.05	.05	.07
7	.81	-.21	.11	-.03	.13
8	.79	-.09	-0.07	.02	.08
9	.77	-.21	.11	-.04	.14
10	.77	-.19	.01	.02	.11
11	.76	-.02	-.01	.11	.11
12	.68	.01	-.16	.18	.09

13	.48	.09	.01	.18	.13
14	.45	-.26	.04	.32	.07
15	-.08	.83	.01	.07	.03
16	-.13	.80	.10	.12	-.02
17	-.07	.79	-.04	.04	.08
18	-.06	.77	.00	.16	.03
19	-.16	.77	.11	.08	.00
20	-.16	.77	.25	.08	-.02
21	-.11	.77	-0.31	.00	-.02
22	-.14	.75	.08	.14	.05
23	-.25	.74	.04	.15	.02
24	-0.38	.68	.05	.20	.02
25	.06	.52	.55	.06	-.11
26	-.07	.34	.41	.20	-.08
27	.01	-.03	.79	.06	.06
28	-.02	-.03	.70	.08	.18
29	.19	-.10	.26	.51	.18
30	-.17	.32	-.17	.48	-.03
31	-.05	.17	.40	.58	.07
32	.05	.39	.08	.62	-.23
33	.06	.31	.22	.58	-.23
34	.00	.23	-.07	.57	.07
35	.03	.17	.01	.52	.07
36	.31	-.08	.10	.38	.22
37	.12	.16	-.12	.32	.04
38	.18	.08	.06	.077	.74
39	.21	-.05	.10	-.033	.71
40	.16	-.03	.11	-.081	.71
41	.21	-.16	.09	.364	.53
42	.22	.19	-0.79	.010	.38
Eigen value	11.925	7.814	2.990	2.055	1.945
% of variance	23.849	15.629	5.980	4.109	3.890
Cumulative %	23.849	39.47	45.458	49.56	53.45

Note: Factor loadings on respective factors appear in bold.

Step -2 Confirmatory Factor Analysis. This step was carried out to confirm the proposed factor structure of the COVID-19 Vaccine Hesitancy Scale through CFA.

Sample. Another independent Sample of 300 comprised of general population in which male ($n = 150$) and female ($n = 150$) age ranged 18 to 60 years ($M = 24.56$ and $SD = 4.95$) education of intermediate, graduate and postgraduate from Quaid- i- Azam University Islamabad, University of Gujrat. The convenient sampling technique was used for collecting data.

Procedure. General population from different public and government sectors were approached through online and manual forms. Online google form link were sent through WhatsApp's, Facebook, and give instruction to share with their friend's circle and family. The participants were informed about the nature, purpose and scope of the study. It was also ensured that information provided by them will be kept anonymous and confidential and may only be used for research purpose only. The questionnaire included no true and false items. At the end of the questionnaire a note of thanks was written for the participant for his/her time and cooperation.

Results. Confirmatory Factor Analysis for the COVID-19 Vaccine Hesitancy Scale confirmed the five-factor solution obtained in EFA. Initially the CFA of the COVID-19 Vaccine Hesitancy Scale $\chi^2(df) = 2724.422(809)$ the model fit indices i.e., CFI = .84, NFI = .78, TLI = .775, RMSEA = .08, were obtained. Initially the values were lower than the criteria. After the covariances were added, the values of $\chi^2(df) = 1430.319(146)$, the model fit indices i.e., CFI = .94, NFI = .90, TLI = .90, RMSEA = .05, were improved. So, model 2 provided the better evidence for CVHS.

Table 2 shows the results of CFA. Factors loadings on all items of five factors of COVID-19 Vaccine Hesitancy Scale were above .30

Confirmatory Factor Analysis (CFA) for Covid-19 Vaccine Hesitancy Scale

Table 2

Factor Loading of Confirmatory Factor Analysis (CFA) for Covid-19 Vaccine Hesitancy Scale (N=311)

Item	Label	Loadings (λ)
Belief in Myths and Conspiracy Theories		
1	لگواتے ویکسین وائرس کرونا جو کہ ہیں رکھتے یقین پر بات اس آپ کیا جائینگے مر بعد سال دو وہ ہیں	.78
2	لیے اس ہے۔ جاتا ہو ختم سے پینے چائے کی ادراک وائرس کرونا کیا ہے نئیں ضروری لگوانا ویکسین	.61
3	جولوگوں ہے آلہ جاسوسی ایک میں ویکسین کرونا میں خیال کے آپ کیا ہے۔ کرنا کو کنٹرول	.78
4	سے جسم انسانی سے لگوانے ویکسین کرونا میں خیال کے آپ کیا ہیں۔ نکلتی شعاعیں مقناطیسی	.79
5	جیسے بیماریاں دوسری سے لگوانے ویکسین کرونا میں خیال کے آپ کیا ہیں سکتی لگ وغیرہ ایڈز، کینسر، کے	.87
6	پڑ دورہ کا دل کو آپ سے لگوانے ویکسین کرونا میں خیال کے آپ کیا ہے۔ سکتا	.96
7	نہیں باپ/ماں انسان پھر سے لگوانے ویکسین کرونا میں خیال کے آپ کیا سکتا۔ بن	.87
8	ہوں پیدا بچے معذور بعد کے لگوانے ویکسین کرونا میں خیال کے آپ کیا گے۔	.91
9	والے ہونے کے آپ سے لگوانے ویکسین کرونا میں خیال کے آپ کیا گا۔ پڑے اثر پر ذہانت کی بچوں	.87
10	طرف کی اسرائیل اور یہودی کہ جیسے لوگوں مغربی وائرس کرونا کیا پھیلا لپے کے کرنے کنٹرول آبادی کی دنیا جو ہے سازش ایک سے گیابے۔	.79
11	چاہتے کرنا کم کو آبادی کی ذریعے دنیا کے ویکسین لوگ کے مغرب کیا ہیں۔	.82
12	گی۔ دے بنا باغی کو نسلوں والی ہونے ہماری ویکسین کیا	.80

- 13 .80 گئی۔ پھیلائے بیہودگی میں نسل ہماری ویکسین کیا
- 14 .81 پر مذہب کا آپ کیونکہ ہے نہیں ضروری لگوانا ویکسین میں خیال کے آپ ہے۔ بچاتا سے کرونا کو آپ یقین
- Perceived Effectiveness**
- 15 .88 وائرس کرونا کو لوگوں تاکہ ہے اہم لگانا ویکسین کہ ہیں سوچتے یہ آپ کیا سکے۔ جا رکھا محفوظ سے
- 16 .78 ہے نہیں نقصان کوئی کا لگانے ویکسین کہ ہوں سوچتا میں
- 17 .86 ہے؟ محفوظ پر طور عمومی ویکسین وائرس کرونا
- 18 .90 ان لگائی ویکسین نے لوگوں جن اور مجھے ویکسین کہ ہوں سوچتا یہ میں ہے۔ رکھتی محفوظ کو
- 19 .90 ہیں۔ سکتے ہو کنٹرول حالات یہ سے لگوانے ویکسین کہ ہوں سوچتا میں
- 20 .92 ہماری خلاف کے وائرس کرونا ہمیں کر بڑھا معافیت قوت ہماری ویکسین ہے کرتی حفاظت
- 21 .81 لگوا ویکسین ہم کہ ہے داری ذمہ سماجی ہماری یہ کہ ہوں سوچتا یہ میں رکھیں۔ محفوظ کو دوسروں اور کو خود کر
- 22 .78 گئی۔ رکھے محفوظ سے وائرس ویکسین کرونا کہ ہے یقین مجھے
- 23 .87 ہے۔ رہی لگا میں مُفت کو اس حکومت کیونکہ چائے لگانا ویکسین جھے
- 24 .87 چائے لگوانی ویکسین کہ ہوں رکھتا یقین پر مشورے کے ڈاکٹر میں
- Religiosity**
- 25 .86 یقین پر شفاء قوت کے دین اپنے میں منظر پس کے ویکسین کرونا آپ کیا ہیں رکھتے
- 26 .83 وجہ کی لگوانے نہ ویکسین کو کرونا عقائد آپ دینی کے آپ کیا ہے۔ سے بچاتی چینی ہے والی سے پھیلانے
- 27 .70 ہے سکتا بچ سے کرونا انسان کرنے سے انکار و ذکر پڑھنے اور نماز کیا ہے نہیں ضروری لگوانا ویکسین لیے اس
- 28 .66 ہے۔ دینا اجازت کی لگوانے ویکسین کرونا کو آپ مذہب /دین کا آپ کیا
- Social and Media Influence**
- 29 .53 ہوئی تیار ویکسینز جو میں امریکہ /یورپ کہ ہیں رکھتے یقین یہ آپ کیا ہیں۔ اچھی سے ویکسین کی چائے وہ ہیں
- 30 .30 روک سے لگوانے ویکسین وائرس کرونا مجھے اثرات مضر کے ویکسین ہیں۔ رہے
- 31 .50 پر رائے کی والوں خاندان میں بارے کے اثرات مثبت کے ویکسین میں ہوں۔ رکھتی / رکھتا یقین
- 32 .55 رائے کی دوستوں اپنے میں بارے کے اثرات مثبت کے ویکسین میں ہوں۔ رکھتی / رکھتا یقین پر
- 33 .77 فراہم معلومات جو میں بارے کے اثرات مثبت کے ویکسین میڈیا سوشل ہیں کرتے فالو کو اس آپ کیا ہے کرتی
- 34 .78 معلومات جو میں بارے کے اثرات مثبت کے ویکسین میڈیا سوشل ہیں۔ رکھتے اعتماد پر اس آپ کیا ہے کرتی فراہم

35	وائرس کرونا کو خود ذریعے کے فارم پلیٹ مختلف میڈیا کے سوشل آپ کیا ہیں۔ رکھتے خبر با میں بارے کے ویکسین	.75
36	فراہم معلومات جو میں بارے کہ اثرات مثبت کے ویکسین میڈیا کیا میں بارے کے ویکسین پر اس آپ کہ ہے کافی لیے کے آپ ہے کرتی کریں۔ فیصلہ	.79
37	/ درست اثرات مضر کے ویکسین وائرس کرونا میں خیال کے آپ کیا ہیں۔ حقیقت	.42
Misinformation		
38	ویکسین کرونا ہے کرتا فراہم معلومات جو میڈیا کہ ہیں سوچتے یہ آپ کیا ہے۔ نہیں درست/ ٹھیک وہ میں بارے کے	.55
39	غلط میں بارے کے ویکسین کرونا ہے دار ذمہ میڈیا میں خیال کے آپ کیا میں پھیلانے خرافات اور خبریں	.72
40	ڈراتی سے ہونے موثر غیر کی ویکسین کو لوگوں میڈیا میں خیال کے آپ ہے۔	.76
41	وجہ کی میڈیا اثرات مضر/ غلط کے ویکسین کرونا میں خیال کے آپ کیا ہیں۔ پھیلتے سے	.75
42	سے وجہ کی اثرات مضر/ غلط کے ویکسین کرونا میں خیال کے آپ کیا ہیں۔ بچکچاتے سے لگوانے ویکسین آپ	.75

Table 2 shows factor loadings of the items of Covid-19 Vaccine Hesitancy Scale. All the items have loading above .30.

Table 3

Correlation of study variables and their subscales (N = 311).

	k	α	1	2	3	4	5	M	SD	Range Potential	Actual
BIM	14	.95	1	-.41***	-.07	-.05	.34***	30.77	11.14	14-70	14-56
PE	10	.93		1	.19***	.41***	-.12***	36.57	8.59	10-50	10-50
R	4	.61			1	.16***	-.11**	15.90	2.87	4-20	8-19
SAMI	9	.72				1	-.19***	28.02	4.98	9-45	18-40
M	5	.72					1	14.97	3.59	5-25	5-24

Note: k = no. of items; α = alpha coefficients of reliability; BIM= Belief in Myths, PE= Perceived Effectiveness, R= Religiosity, SAMI= Social and Media Influence, M= Misinformation, M = Mean; SD = Standard Deviation.

Table 3 shows the no. of items, Cronbach's alpha, Mean, Standard Deviation, and the Range of Covid-19 Vaccine Hesitancy Scale. The results showed alpha reliability of the subscales of COVID-19 Vaccine Hesitancy Scale was calculated as .95(Belief in myths & conspiracy theories), .92 (Perceived effectiveness), .61(Religiosity), .72(Social and Media Influence), .72(Misinformation).

Discussion

The aim of current research was to develop the instrument to assess the COVID-19 Vaccine Hesitancy Scale in general population of Pakistan. COVID-19 was first reported in Wuhan, China, in early 2019 (Adhikari *et al.*, 2020). There initially was no approved treatment for the COVID-19 virus (Cousins, 2020). In a short span of time, number of vaccines were produced by pharma industries worldwide and most of them have been found to be considerably safe in all respects (Hodgson *et al.*, 2021). However, this was found that the aim of achieving herd immunity against COVID-19 could not be materialized because of a factor called vaccine hesitancy (Ashby & Best, 2021).

There were few scales to measure COVID-19 vaccine hesitancy, developed in different countries of the world which specifically highlighted the factors responsible for vaccine hesitancy in their populations. Till this date not a single scale is developed in English or Urdu to measure vaccine hesitancy of Pakistani population. So, the aim of present study was to develop COVID-19 vaccine hesitancy scale for Pakistani population highlighting factors which are contributing to their temporary refusal of vaccine.

For COVID-19 vaccine hesitancy scale 54 items pool were generated after taking experts' opinion 49 items were retained and EFA was run on sample of 311 individuals belonging to different sectors of life to explore the factors. Factor

analysis revealed 5 factors solution for the 49 items of COVID-19 vaccine hesitancy scale and explained 53.45% of the variance. Items having factor loading $> .30$ were retained and 7 items was deleted, and finally 42 items were retained. Those factors that have Eigen value greater than 1 were retained (Field, 2005). It was determined that construct of the pandemic stressor in this pandemic is multidimensional in nature. Following are the finalized subscales.

Belief in Myths

This subscale reflecting the covid-19 vaccine hesitancy related to firm belief in myths and conspiracy theories because of the personal belief of general population. It had a total of 14 items.

Perceived Effectiveness/ Side Effects

Perceived effectiveness or side effects subscale assess the vaccine hesitancy due to the perceived effectiveness or side effects of a wide range of covid-19 vaccines available in public and government sectors of Pakistan. It had total 10 items

Religiosity

This factor is related with the religious beliefs practiced by the general population of Pakistan. It had a total of 4 items

Role of Social and Media Influence

This subscale related with social and electronic media influence on general population of Pakistan which is a key factor of vaccine hesitancy. It had a total of 9 items.

Misinformation

This subscale is accessing the role of misinformation related to Covid-19 Vaccine spread by the media which is leading towards vaccine hesitancy. It has a total of 5 items.

Reliability estimates were also computed to validate the instrument. The results showed that the alpha coefficient reliability for the subscales of COVID-19 vaccine Hesitancy Scale .95 (Belief in Myths & Conspiracy Theories), .92 (Perceived Effectiveness), .61 (Religiosity), .72 (Social and Media Influence), .72 (Misinformation).

Limitations and Future Research

The results of the present study should be interpreted with care since it has few shortcomings which need to be addressed. The current study had a sampling error as one of its shortcomings. In this study, both offline and online data gathering methods were applied under the umbrella of a hybrid data collection method. The adoption of a single mode of data collection whether online or offline, is therefore advised for future study. In addition, majority of the study sample came from Punjab and KP, which might be poorly representing the whole population of Pakistan. Sample from problematic areas of Pakistan like agencies of North Waziristan was not part of the study which was one of the prominent areas mostly affected by polio due to non- acceptance of vaccine. Therefore, the results of the study could not be generalized on Pakistani population. It is advised that a more representative sample from all provinces of Pakistan should be used for future research. Covid -19 vaccine Hesitancy Scale was developed in this study which don't have a composite scoring future researcher can work to make its composite scoring. Scale developed in this study requires at least matric level

of qualification for the participants to respond. Sample of age range below 18 and above 60 years were not included in the sample. Hence, for future studies people with no literacy should be included in the study in order to further explore the factors related to vaccine hesitancy. Future investigations are suggested for validation and confirmation of the Covid-19 vaccine hesitancy scale developed in this research, as well as cross-cultural validation of the measure. Another recommendation about sample size is that future researchers should use a larger sample size to ensure generalizability of the research findings.

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