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COVID-19 Vaccination hesitancy and associated factors among Pakistani Population

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ABSTRACT

COVID-19 pandemic has caused global healthcare and economic crises and mass vaccination to acquire herd immunity seem to be the only solution. Present study aimed to evaluate the intent of Pakistani population towards vaccination and to uncover the barriers associated with vaccine reluctance. This cross-sectional study included responses of 855 Pakistani residents. Respondents' knowledge of COVID-19 infection, intent of vaccination and barriers towards vaccine refusal were evaluated. Participants were categorized on the basis of knowledge score, risk of disease and other demographic characteristics. Descriptive statistics were used for calculating frequencies and percentages, means and Chi-square test was utilized for cross-tabulation. A multinomial logistic regression model was executed to identify the predictors of vaccination intention. Significance level was set at the p-value of ≤ 0.05 . Prevalence of vaccine refusal was 40%. COVID-19 vaccine is not Halal, negative propaganda on social media against the vaccine, discouraging advice from social circle and clerics, concerns regarding efficacy, fear of immediate and late adverse reactions were the major barriers identified towards vaccine hesitancy. Around one-third of the study population did not consider COVID-19 as a serious disease and associate it with conspiracy theory. The mean score of participants towards COVID-19 knowledge was 5.5 ± 1.6 (range: 0-9). Having a college degree, living in an urban area, working in a healthcare field and being in a higher risk category increases the chances of vaccine acceptability. High vaccine refusal has been reported. Swift action is required to address the concerns of the public through awareness campaigns incorporating religious and social elements.

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1. Introduction

Coronavirus disease (COVID-19), a major public health threat, has affected almost every nation in the world. COVID-19 pandemic has caused significant global healthcare and economic crises and still, there appears to be no permanent solution.¹ As of April 2021, after 15 months of the first reported case of COVID-19, over 139 million confirmed cases have been reported with almost 3 million mortalities.² Pakistan, the fifth most populous country in the world is also among the COVID-19 hard-hit countries, with more than 750,000 confirmed cases and with a death toll of 16,000 till April, 2021.³

To hinder the spread of the virus, various strategies were imposed by governments including travel restrictions and strict lockdowns which led to a colossal burden on the economy triggering high inflation and unemployment.⁴ Epidemiologists expect that there might be another surge of cases because of imprecise enforcement of preventive strategies, abandonment of social distancing, transmission dynamics, new variants of virus and complex immune response.⁵ The current circumstances have exhorted the global scientific community to track down a promising solution to this problem in terms of prevention and treatment. Historical data shows that vaccines have been found extremely valuable in saving lives, suppressing pandemics, reducing ailment and disabilities.⁶ This led scientists all over the world to work on the development of an efficient, reliable, and safe vaccine.⁷ Normally, for the development of an effective and safe vaccine, at least over 10 years of effort are required because vaccine development is an intricate and long-winded process.⁸ However, the previous ongoing research on the MERS-CoV and SARS-CoV-2 accelerated the development of a vaccine that could pass the mandatory safety tests and be made available to the public.⁹ According to World Health Organization, at least seven different vaccines for COVID-19 have been approved in various countries.¹⁰ Moreover, 200 vaccine candidates are in development with 60 in their last trials.¹⁰ In December 2020, after approval of the first COVID-19 vaccine,¹¹ the vaccination process has been rolled out in various nations. As of April 2021, over 740 million people have been vaccinated against COVID-19 including 1.4 million people from Pakistan.¹²

No doubt vaccines have been proven as a successful measure of disease prevention. In 2009, US experts estimated vaccines prevented over 20 million cases of 9 specific diseases and 42000 deaths in neonates and profited the economy with almost \$69 billion.¹³ Still, vaccine aversion is a major global problem reported by World Health Organization.¹⁴ Studies have reported that vaccine hesitancy is mainly based on widespread myths and controversial beliefs; that vaccination is associated with autism, neurological disorders, infertility and developmental disorders.^{14,15} Unfortunately, vaccine hesitancy is a major public health problem in Pakistan. Despite hundreds of polio eradication campaigns, Pakistan is still considered as an exporter of Wild Polio Virus (WPV) which is the result of vaccine hesitancy.¹⁶ Supposedly, no previously published literature has assessed the acceptance and concerns of the Pakistanis regarding the COVID-19 vaccination. Considering the COVID-19 situation which has strikingly harmed the economic and social life nationwide and historic vaccine hesitancy in the Pakistani population, this study was aimed to determine the perception, acceptance and concerns of the public regarding COVID-19 vaccination.

2. Methods

This cross-sectional study was principally conducted at Northwest General Hospital, Peshawar, Pakistan in last week of April 2021. Non-probability convenience sampling technique was used for data collection. Ethical approval was granted by the Independent Ethics Committee of Northwest General Hospital and Research Centre. The inclusion criteria for the study were; any

Pakistani national/resident over the age of 18 years with no major disease. Questions about age, nationality and general health were asked to ensure the inclusion criteria. Stable OPD patients, their attendants and relatives were approached by trained research assistants and a self-administered questionnaire was presented. A legitimate written consent based on World Health Organization guidelines was signed by each individual. A brief introduction of the study, its importance, purpose and directions to fill the questionnaire were given prior to filling the survey form. Research assistants accompanied the participants and helped them in case of any query or difficulty regarding the questionnaire. Same questionnaire was also created on google docs and was shared in various verified Pakistani Facebook groups and with the contact list of investigators of this study with the intent to collect a larger sample size and to have participation from different districts of country. In electronic questionnaire, a consent statement was posted in the beginning of the survey with 'yes' and 'no' options. Those who said 'no' to that statement were deemed ineligible for the final analysis. The data collection procedure conforms to the standard ethical guidelines and followed the Helsinki declaration.

3. Study instrument

The questionnaire was made after an extensive literature review under the supervision of senior public health experts, and items from previously published studies were extracted and modified.^{17,18} The questionnaire was basically designed in English. However, it was also translated to Urdu (National language of Pakistan) and a bilingual questionnaire was presented to participants. Our questionnaire comprised five sections. The first section comprised an informed written consent form and statement regarding confidentiality and anonymity. The second section consisted of demographics and other baseline characteristics, including age, gender, weight, marital status, disease history, education and residency status. Based on demographics and disease history, participants were divided into 'Low risk' and 'High risk' categories utilizing Centres for Disease Control and Prevention (CDC) guidelines.¹⁹ The second section was based on questions related to participants' perception and experience with COVID-19. The third section comprised questions regarding participants' acceptance and concerns towards COVID-19 vaccination. The fourth and final section of questionnaire assessed the participants' knowledge regarding COVID-19 with a 9-item scale with three choices (Correct, Incorrect, Don't know) ranging score between 0-9. The knowledge scale was a modified form of Zhong et al.²⁰ study instrument which is based on guidelines of National Health Commission of the People's Republic of China.²⁰ Respondents who correctly answered at least six out of nine questions were categorized as participants with high knowledge, while those who scored below were considered as participants with low knowledge. The final drafted questionnaire was sent to three faculty members of Community Medicine department at Northwest school of Medicine, Peshawar, Pakistan for further evaluation, after their approval, a pilot study was conducted. A sample size of 30 was included in the pilot study and internal consistency of the questionnaire was measured. Overall, Cronbach's Alpha coefficient of 0.74 was obtained which showed that questionnaire's reliability was acceptable.

4. Statistical Analysis

Sample size was calculated using Openepi® software. Keeping anticipated frequency 50, confidence level 95%, margin of error 5% and design effect 1 the minimum required sample size was 384. At 99% Confidence level, the calculated sample size was 664. Data was extracted from google forms by creating a spreadsheet and transferred to IBM® SPSS® Statistics Version 23.0. Data from printed questionnaires were manually entered into the SPSS spreadsheet. Descriptive statistics were used for calculating frequencies and percentages, and continuous variables were presented as means

and standard deviations. A multinomial logistic regression model was utilized to evaluate the demographic characteristics related to the participants' intent to be vaccinated. Important baseline characteristics were also cross-tabulated with knowledge categories using the Chi-square test. Confidence intervals 95% and p-value of 5% was considered significant.

5. Results

Eight hundred and fifty responses were included in the final analysis, 511 responses were collected through printed questionnaires while 344 responses were extracted from google forms. The mean age of the participants was 26.9 ± 6.7 (range: 18-60). The majority of the sample population comprised young individuals with an age range of 18-29 years (71.6%). More than half of the respondents were male (59.5%) while (40.5%) were female. Around 40% of the study population was married and 32% had children. The sample population was fairly educated as almost half of the participants (53.3%) had a bachelor's or a higher degree. 20% of individuals responded they were suffering from any chronic disease, and based on their age, weight and health profile 4.7% of the people were categorized into the COVID-19 high-risk category. Table 1 shows baseline characteristics and basic health profile of participants. Respondents' perception toward COVID-19 is outlined in Table 2. One-third (34%) of the respondents were of opinion that COVID-19 is not a dangerous ailment. Almost half of the study sample (54%) witnessed a COVID-19 related death in their locality while 27% of the sample population was infected and recovered from COVID-19. Results have exhibited that 60% of the participants will avail of the COVID-19 vaccine if offered, while 40% shown hesitancy towards vaccination drives. Even half of the study sample (49.4%) was ready to pay a moderate price to get vaccinated. Table 2 shows detailed attitude of participants towards the COVID-19 vaccination.

The most prevalent factor raising concern among individuals regarding COVID-19 vaccination was the composition of ingredients. Around 70% of the populace had an opinion that vaccine components are not Halal (permissible by Muslim law). One-third of the participants were concerned that vaccine may cause physical and psychological side effects and it may be a global conspiracy. Table 3 demonstrates the key factors which contribute towards COVID-19 vaccine dubiety. Multinomial model in our results predicted that a higher level of education, living in an urban area, being a high risk patient, working in healthcare field and belonging to a COVID-19 red zone increases the chances of an individual to respond "Yes" regarding intent to be vaccinated as shown in Table 4.

The better score on COVID-19 knowledge scale was also significantly proportional to responding "Yes" regarding intent to be vaccinated. Using the knowledge scale, the mean knowledge score obtained was 5.5 ± 1.6 (range: 0-9). Majority of the participants could not score six or more points on the knowledge scale. So, according to our set criteria, 633 (72.8%) respondents were categorized as participants with low COVID-19 knowledge and 222 (27.2%) were considered as participants with high knowledge. Cross-tabulation of important demographic characteristics with knowledge showed that those who had a college degree or higher performed better in knowledge test than those who were less educated ($p < 0.05$). Similarly, those who were married and working in a health-care-related field were significantly more knowledgeable regarding the basics of COVID-19 as shown in Table 5. Results have additionally exhibited that 76% of the participants had knowledge about common symptoms of COVID-19 which includes, fever, dry, cough, fatigue, myalgia etc. 77% of the respondents were of opinion that COVID-19 spread can be prevented by wearing masks and practicing social distancing while 80% of the participants knew that frequent hand washing and use of sanitizers is an effective strategy in preventing COVID-19. However, 39% of the participants had a

false perception that drinking green tea and using herbs can prevent COVID-19. Similarly, 44% of the study sample had a belief that unclean water is the source of COVID-19 spread.

6. Discussion

The current investigation was conducted when COVID-19 cases and mortalities were all-time high but still only 60% of the study population intended to be vaccinated in near future. In comparison, a study from Ecuador showed that 97% of their study population will to get a vaccine.²¹ A Chinese report detailed that 91% of the respondents were willing to accept a vaccine.²² Surveys from France²³ and Saudi Arabia²⁴ reported that 76% and 65% of the study population showed acceptance towards COVID-19 vaccination. A worldwide survey from nineteen nations also reported that 71.5% of the sample population was likely to take a COVID-19 vaccine if offered.²⁵ However, studies from the United States²⁶ (57%) and Jordan¹⁷ (37%) demonstrated a moderately lower level of COVID-19 vaccine acceptance among the general public. In the current study, demographic characteristics such as being male, less age, low education, working in a non-medical field, belonging to a rural area negatively affected the respondents' intention to be vaccinated. Several other studies across the globe, including the European and Asian region, revealed that gender, age and education play a significant role in vaccine acceptance or hesitancy.^{17,22,23,27} Recognizing these variables and focusing awareness campaigns on these groups might help in overcoming vaccine reluctance and the goal of herd immunity can be achieved in time. Moreover, our results suggested that those people who were at higher risk of COVID-19 related complications had a reduced hesitancy towards vaccination. Similar outcomes were reported by several international studies.^{23,26} This trend suggests that bringing awareness among individuals about the earnestness of the ailment is fundamental in decreasing vaccine scepticism.

Vaccination is considered a 21st-century miracle of public health.²⁸ Vaccination ensures the protection of immunized individuals but can also protect the entire community by achieving herd immunity. Vaccinating most of healthy individuals in a community can indirectly protect those who cannot be immunized (diseased/immunocompromised). However, this population-level effect is only achieved when a significant proportion of the population is immunized.²⁹ On-premise of currently available data, scientists have expected that immunization of 71% of the total population may result in herd immunity against COVID-19.³⁰ In our sample, the vaccine acceptance rate was roughly 60% so the government and other public health agencies in Pakistan must take necessary measures to increase awareness among the population regarding COVID-19 vaccination to bring down vaccine hesitancy in order to achieve herd immunity.

Unmasking the reasons for vaccine reluctance could help experts in improving the intention of population towards vaccination. In order to eliminate the barriers to vaccination, it is critical to comprehend and address the concerns of the public. The most prevalent reason for vaccine hesitancy mentioned by the sample population was the concern about the ingredients of vaccine. Almost 70% of the respondents had a false perception that components of the COVID-19 vaccine are not Halal. In the past, religious opposition by clerics who are less acquainted with science was a major factor in the failure of immunization programs against polio in rural areas of Pakistan, Afghanistan and Nigeria.³¹ Since, majority of Pakistani population respects the guidance of Islamic scholars. The false perceptions among the public can be addressed by inviting well educated religious scholars in public health awareness and promotion campaigns where these false beliefs should be rectified considering scientific facts and sharia law. The second major factor causing hindrance towards COVID-19 vaccination was the spread of false information through social media. Around

41% of the respondents pointed out that information on social media are raising concerns. The most common threads on social media were regarding infertility, psychological and neurological adverse effects an individual can experience after vaccination. A global study also suggested that social media plays a significant role in spreading false information regarding vaccine which brings about a conviction that vaccinations are unsafe and part of a conspiracy.³² A belief in the conspiracy theories related to COVID-19 vaccination among the present study population was also observed. Such beliefs have also been reported by a study from Jordan.¹⁷ Such beliefs are held accountable for the failure of previous immunization programs in Pakistan.³³ In these circumstances, it is fundamental for Pakistan Electronic Media Regulatory Authority to highlight the sensitivity of this issue and any individual spreading fictitious speculations should be strictly dealt with Law. The other concerns identified in the current study were related to vaccine efficacy (25%), risk of inoculating disease (21%) and fear of allergic reactions (21%). Concerns of vaccine efficacy were also reported by several international studies.³⁴ However, this concern is of less significance in light of the fact that, with the availability of more data and awareness campaigns, it might be easier to explain the potential benefits and discard the concerns related to efficacy.

The present study additionally aimed to determine the knowledge of participants associated with COVID-19 infection. It was uncovered that the knowledge level of the majority was moderate. However, 34% of the participants were of opinion that COVID-19 is not a dangerous disease. The moderate level of knowledge may contribute to the overall vaccine refusal. An investigation led in rural areas of Pakistan likewise inferred that less knowledge about a disease negatively influences the intent of vaccination.³⁵ Studies that showed higher acceptance of COVID-19 vaccination also exhibited a good level of knowledge regarding COVID-19 infection among study sample.^{21,22}

World Health Organization has published a report which has discussed social contemplations of COVID-19 acceptance and proposed few methods to expand vaccine acceptability.³⁶ These methods include highlighting the severity of disease, spreading authentic information, education about the importance and efficacy of immunization, discussing and resolving the uncertainty and false perceptions. These goals can be achieved rapidly by monitoring media, introducing electronic, print and social media campaigns, augmenting the need for fact-checking culture and incorporating social and religious elements.³³ Social, religious and governmental joint effort will assemble public trust in the COVID-19 immunization program and help the nation achieve herd immunity.

7. Strengths and Limitations:

To the best of our knowledge, this is the first study aimed to determine the perception of the Pakistani population regarding COVID-19 vaccination. The potential strength of the present study is large sample size and participation of individuals of various age groups from various rural and urban districts. Another plus point of this study is that it is conducted when the government of Pakistan has started free COVID-19 vaccination drive for elderly people while the vaccine is also available for youngsters at a moderate price. This program has led to the vaccination of over one and a half million population by the end of April 2021.¹² The availability of vaccine reflects a better and true perception of the population towards acceptance of immunization program. However, the current study does have few limitations. This is a cross-sectional study and a non-probability convenience sampling technique was used. Furthermore, 40% of the responses were recorded utilizing google survey forms which may lead to potential bias. Besides, this study didn't investigate the motivation behind the reluctance or acceptance of the COVID-19 immunization program. In our next project, we

anticipate conducting a qualitative analysis of the public's perception regarding reluctance of COVID-19 vaccination to get a deeper insight into the potential barriers and their motives behind it.

8. Conclusion

The results of current study have demonstrated that a significant proportion of the study sample (40%) is reluctant in accepting a COVID-19 vaccine. The major reasons identified behind the vaccine hesitancy include concerns regarding ingredients of vaccine as a majority of the population was of opinion that the COVID-19 vaccine is not Halal. Furthermore, numerous individuals raised concerns over the efficacy of vaccine, their potential immediate and late adverse effects such as infertility and psychological impairment. Discouraging advice from clerics, family members and friends was also a red flag towards vaccination. Around one-third of the study population did not consider COVID-19 as a serious disease and associate it with conspiracy theory. There is a cardinal need to raise awareness at a mass level regarding the severity of COVID-19 infection, the importance of vaccination and its safety, efficacy and viability. Government should assemble religious and social elements to gain public trust and address the concerns of the population. Failing to do so, unfortunately, will lead to the collapse of herd immunization program.

9. Tables and Figures

TABLE 1: Baseline Characteristics of study Sample

Characteristic	Category	Frequency (N= 855)	Percentage (100%)
Age group	18-29 years	612	71.6%
	30-40 years	203	23.7%
	41 above	40	4.7%
Gender	Male	509	59.5%
	Female	346	40.5%
Weight Status	Underweight	12	1.4%
	Normal weight	511	59.8%
	Overweight	332	38.8%
Marital Status	Married	340	39.8%
	Unmarried	515	60.2%
Do you have children?	Yes	276	32.3%
	No	579	67.7%
Educational Level	Primary	10	1.2%
	Secondary	111	13%
	Higher Secondary	278	32.5%
	Bachelors	373	43.6%
	Post-graduation	83	9.7%
Field of work	Healthcare related	407	47.6%
	Non-healthcare related	448	52.4%
Residency	Urban	447	52.3%
	Rural	408	47.7%
Your district is in COVID-19 red zone?	Yes	305	35.7%
	No	550	64.3%
Are you suffering from any chronic disease?	Yes	171	20%
	No	684	80%
Do you have any of the	Yes	92	10.8%

following diseases? (Diabetes, Hypertension, Lung related problems, chronic allergies, Heart problem, Kidney Disorder, Auto immune disorder, Anemia, Stroke, Organ Transplantation.)	No	763	89.2%
Risk Degree of participant	Low risk High risk	815 40	95.3% 4.7%

Table 2: Participants perception and attitude towards COVID-19 infection and vaccination

Questions	Yes	No
COVID-19 infection related questions		
Do you think COVID-19 is dangerous?	564(66%)	291(34%)
Do you think social distancing can prevent COVID-19?	526(61.5%)	329(38.5%)
Did you suffer from COVID-19 infection?	235(27.5%)	620(72.5%)
Anyone from your friends/family suffered from COVID-19 infection?	493(57.7%)	362(42.3%)
Do you personally know anyone who experienced severe symptoms of COVID-19 infection?	466(54.5%)	389(45.5%)
Have you seen any COVID-19 related deaths in your proximity?	465(54.4%)	390(45.6%)
Are you concerned that you may get affected by COVID-19 in near future?	507(59.3%)	348(40.7%)
COVID-19 vaccination related questions		
Did you take the influenza vaccine last year?	174(20.4%)	681(79.6%)
Do you think vaccination is best option to tackle COVID-19 spread?	536(62.7%)	319(37.3%)
If COVID-19 vaccine is offered to you, will you take it?	510(59.6%)	345(40.4%)
Are you vaccinated against COVID-19?	290(33.9%)	565(66.1%)
Anyone in your social circle has received COVID-19 vaccine?	422(49.4%)	433(53.6%)
Did you avail or willing to avail free COVID-19 vaccine from government of Pakistan for elderly people in your family members?	436(51%)	419(49%)
Are you willing to get COVID-19 vaccine for yourself or elderly family members with a moderate price tag?	422(49.4%)	433(50.6%)

Table 3: Reasons participants provided for vaccine hesitancy

Factors/Reasons	Frequency (%)
Ingredients of COVID-19 vaccine are not Halal.	598 (69.9%)
Information from social media shows vaccine is harmful to human body.	352(41.2%)
Friends/family/clerics have advised that COVID-19 vaccine is harmful.	318(37.2%)
COVID-19 vaccination is a global conspiracy to control human minds.	251(29.4%)
COVID-19 vaccine can cause long term physical adverse effects on body.	245(28.7%)
COVID-19 vaccine can cause psychological and neurological adverse effects.	240(28.1%)

COVID-19 vaccine is not safe/effective.	221(25.8%)
People have reported on social media that vaccine has caused adverse effects.	184(21.5%)
COVID-19 vaccine may cause immediate allergic reaction.	184(21.5%)

Table 4: Multivariate predictors of responding “Yes” regarding intent to be vaccinated

	B	S.E	Wald	df	p	OR	95% CI for OR Upper Lower	
Age Group 18-29 years 30 and above	-4.71 Reference	.520	.821	1	.365	.625	.226	1.72
Gender Male Female	-.004 Reference	.240	<.001	1	.988	.996	.622	1.59
Marital Status Married Unmarried	-.028 Reference	.274	.011	1	.917	.972	.568	1.66
Do you have children? Yes No	-.552 Reference	.282	3.83	1	.050	.576	.331	1.01
Education Level Primary Secondary Higher secondary Bachelors Post graduation	-1.03 -.871 -.568 -.124 Reference	.707 .315 .276 .268	2.12 7.62 4.25 .213	1 1 1 1	.145 .006 .039 .644	.357 .418 .566 .883	.089 .225 .330 .522	1.42 .777 .972 1.49
Field of work Healthcare related Non-healthcare related	.168 Reference	.150	1.25	1	.263	1.18	.881	1.58
Residency Urban Rural	.228 Reference	.149	2.32	1	.128	1.93	1.25	.937
COVID-19 red zone district? Yes No	.065 Reference	.158	.167	1	.683	1.06	.782	1.45
Risk Degree of								

participant	.315	.336	.881	1	.348	1.37	.709	2.64
High risk	Referenc							
Low risk	e							

B, *B* coefficient; *S.E*, standard error; *Wald*, Wald chi-square test; *df*, degrees of freedom; *p*, *p*-value; *OR*, odds ratio; *CI*, confidence interval.

Table 5: Cross tabulation of demographics with participants having low and high knowledge

Characteristic	Participants with low knowledge (N=623)	Participants with high knowledge (N=232)	χ^* and p-value
Gender			
Male (N=509)	362 (71%)	147 (29%)	1.93
Female (N=346)	261 (75%)	85 (25%)	.183
Marital status			
Married (N=340)	230 (68%)	110 (32%)	7.77
Unmarried (N=515)	393 (76%)	122 (24%)	.006
Educational Level			
Secondary and below (N=399)	301 (75%)	98 (25%)	17.7
Bachelors and above (N=456)	322 (71%)	134 (29%)	.001
Field of Work			
Healthcare related (N=407)	276 (68%)	131 (32%)	10.1
Non-healthcare related (N=448)	347 (77%)	101 (23%)	.002
Risk Degree of participant			
Low risk (N=815)	597 (73%)	218 (27%)	1.3
High risk (N=40)	26 (65%)	14 (35%)	.275

χ^* = Pearson's Chi-square value

DECLARATIONS:

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Conflicts of interest/Competing interests: Nil

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Consent to participate: Proper consent was taken from each participant

Consent for publication: Not required

Availability of data and material: Available

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MK: Data collection, revisions, proof reading.

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