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GAP BETWEEN SCIENCE AND SOCIETY: AN EVIDENCE FROM SOCIETAL MYTHS ABOUT COVID-19

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Abstract
Pakistan has Science, Technology and Innovation policies (19984, 1993, 2012) that aim S&T development but this research argues that policies lack inclusion of society. This study uses myths develops in society about the origin and vaccination of COVID-19 as evidence for the missed opportunities create due to a mismatch between scientific knowledge supply and demand . A sharp divide in the opinion of public on the origin of virus, persistent denial to follow standard operating Procedures (SoPs) during cultural and religious rituals and further establishing doubt on vaccination and inoculation process creates a dangerous public health issue. It is a high time to network the science, cultural, religious actors to distinguish between the scientific knowledge from the non- scientific knowledge to develop awareness in public about COVID-19 specifically and other health related misconceptions generally. The national science agenda is needed to be revised using the evidence based on societal response during COVID-19.

INTRODUCTION

Since its inception in 1947, Pakistan has four policies dealing with science, technology and innovation (STI). The three policies are documented in the years of 1984, 1993 and 2012. The first speech of Quaid-e-Azam Muhammad Ali Jinnah, the founder of Pakistan, in 1948 at Islamia Collage Peshawar is envisaged as first Science and Technology (S&T) Policy of Pakistan. In his visionary message, Quaid-e-Azam said that ―*education is required but the education will be of the right type. Means that education will be given to fulfill the need of the society and country*‖.

The STI policies aim at the development of S&T in country but remain averse to develop an interface between science and society through an exchange of knowledge. It seems that science, technology and innovation remain kept developing in the ivory tower of universities, research labs and centers and a general public remain unaware from the use and benefits of the research results. Not any STI policy is designed for inclusion of society in the knowledge production and dissemination process. Currently, STI indicators

e.g. number of scientist, R&D expenditures; R&D institutes have no role to assess the development of S&T for the welfare of society. Previous researchers, accept that the worlds of science and society are far apart culturally and epistemologically, and thus directing interaction between them is challenging (Elizabeth et al., 2015).

Pakistani society is one where scientific information about health related issue remain accompany in parallel with non-scientific information which is based on stereotype cultural and religious traditions. A multimodal approach that examines both scientific and non-scientific information circulating in society is therefore essential towards understanding the etiology of epidemics.

Myth is commonly considered as a folklore genre consisting of narratives/stories that play a fundamental role in human beings' everyday lives. These are often endorsed by leaders/rulers/religious preachers and explain to a great extent the functioning society and shape the beliefs of people (Sahoo et al., 2020). There is a potential role of cultural and religious beliefs/traditions/customs/rituals, which add a flavor to the public's mindset in a particular region/country and influence the propagation or acceptance of a myth (Qureshi and Sheikh, 2006).The rumors and conspiracy theories in the minds of people about the other prevailed viral diseases in Pakistan e.g. Hepatitis A, B and C, Polio, Tuberculosis is also providing an evidence of the presence of non-scientific knowledge in society. At the heart of the problem are current science policies that favor basic and applied research approaches which alone are inadequate to address the growing complexity of problems we seek to solve and simply reinforce a structural gap between the ―production and use of scientific information. In the context of society‘s long-standing suspicions of Western interests in medical interventions, a public level rejection of the medical explanation of COVID-19 epidemic raises a pivotal policy question for a forthcoming Science and Technology Policy, tentatively

in 2022, to bridge the gap between scientific knowledge and an understanding of a general public. At the heart of the problem are current science policies that favor basic and applied research approaches which alone are inadequate to address the growing complexity of problems we seek to solve and simply reinforce a structural gap between the ―production and use of scientific information‖ (Elizabeth et al., 2015; Sarewitz and Pielke 2007).

In the above context, this research question is how to bridge the gap between science and society through reconciling the supply and demand of scientific knowledge towards a societal health related issue. Universities, R&D centers, Research organizations supply the scientific knowledge and on the other hand, demand of scientific knowledge is created by policy makers, decision makers and public. In order to answer the above question, the following research objectives are designed:

- To identify myths about the origin, prevention and vaccination ofCOVID-19 to reflect the society‘s response to pandemic.
- To provide a classification of myths, to reflect how a society‘s response to a disease is shaped by long standing cultural and religious beliefs.

To provide an evidence of a gap between science and society through the societal response of COVID-19 to draw implications for the STI policy of Pakistan.

2: Theoretical Framework: Development of Myths in a gap between science and society

The core idea about a certain issue that is based on _folk‘ and _lay theories‘ is termed as myth. Myths related to various infections have been prevalent from time to time, and it takes a long battle to demystify the existing myths by providing a realistic evidence-based approach (Sahoo et al., 2020).This research adopts the framework (Sarewitz and Pielke 2007). to conceptualize science in terms of ―supply‖ of knowledge and information, societal outcomes in terms of a ―demand‖ function that seeks to apply knowledge and information to achieve specific societal goals, and the relationship between the two as ―reconciled,‖ in part, through science policy decision processes (see figure 1). Science policy decisions are no made in a vacuum but with some consideration or promise of societal needs and priorities (Elizabeth et al., 2015).

DEMAND: Do users have specific information needs?

SUPPLY: Is scientific information produced?	**YES**	**NO**
YES	***SUPPLY & DEMAND RECONCILED:*** Users' information needs reconciled with the production of scientific information.	***MISSED OPPORTUNITY:*** Research priorities misaligned or users are unaware of possible utility of information produced.
NO	***MISSED OPPORTUNITY:*** Research priorities need modification in order to respond to users' information needs.	***SUPPLY & DEMAND RECONCILED:*** Information not produced nor needed by users.

Fig. 1 Missed Opportunity Matrix Source (Elizabeth et al., 2015)

The above matrix (Elizabeth et al., 2015), assumes users as the science policy makers and individuals of a society for which decision makers design policies based on scientific information. In the matrix, first cell (upper left) describes the optimal relationship between the supply and demand of knowledge achieved through an ideal process of representative deliberation. The fourth cell (lower right), represent no relationship between supply and demand e.g. sometimes information is not relevant to users or some type of information may support decisions that benefit some people but adversely affect other. The 2nd (upper right) and 3rd (lower left) cells discuss the dynamics of interaction between scientific information produced and the users of the information. This research develops a proposition that the societal myths are developed due to a gap between the science and society and need to be treated as missed opportunities for science agenda. Inclusion and representation of users is particularly important in the development and implementation of policies, and in integrating knowledge into socio-cultural and organizational contexts. Useful information must be salient and relevant to the problem, credible and of high quality, and legitimate, in that users believe that the information was produced without political suasion or bias (Cash, 2001).

3: Spread, Strategies, and Remedial Solution Adopted: COVID-19 in Pakistan

In January 2020, the World Health Organization (WHO) addressed COVID-19 upsurge as the 6th Public Health Emergency of International Concern (PHEIC). From March-2020 to March-2021, 118 million infections and 2.63 million deaths are recorded from COVID-19, across the globe. There is a major possibility that more deaths can be recorded with each passing day. In this international context of COVID-19, this section describes the spread of COVID-19 in Pakistan, strategies adopted to intercept pandemic and adoption of COVID-19 vaccines by Government.

3.1 : Spread of COVID-19 in Pakistan

Pakistan is one of the vulnerable states, facing COVID-19 pandemic since the first case reported in February 2020 in Karachi by the Ministry of National Health Services, Regulation and Coordination (NHSRC). The virus rapidly expanded to the whole country and within a month the infection increased and infected around 5000 confirmed infected cases (Waris et al., 2020; Jamil, 2020]. However, in March 2021, the infected patients from COVID-19 are estimated around 600,198, the death recorded up to 13,430 and approximately 1709 are found to be in critical condition. Pakistan has population estimated around 223,831,323and 2.3% per 100,000 population infected by COVID-19 epidemic. Registered infections and deaths in Pakistan are: 182,576 in

Punjab, 260,661 in Sindh, 75,052 in KPK, 46,963 in Islamabad, 19,171 in Baluchistan,10,816 in AJK and 4,959 in GB (MNHSRC, 2021). (see Figure 2 below).

Provinces, capital and federally administered Tribal area	Infected	Death
AJK	10816	1077
GB	4959	103
SINDH	260661	4452
PUNJAB	182576	5698
KPK	75052	2138
BALUCHISTAN	19171	202
ISLAMABAD	46963	520

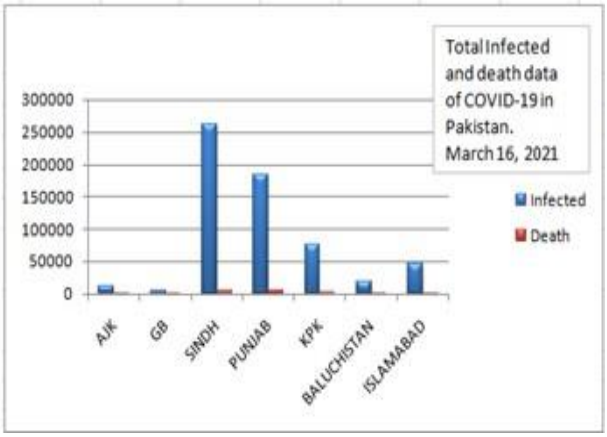

Fig.2 (Dated: March 16, 2021) number of infection and deaths province-wise in Pakistan by COVID-19 pandemic.

3.2 : Strategies adopted by Pakistan to intercept Pandemic

The Government of Pakistan also took various steps to combat pandemic by establishing isolation/quarantine wards, hospitals, laboratories, and awareness campaigns. Moreover, national and provisional government allocates emergency/relief funds for public. The measures taken during COVID-19 control are early case detection, testing, tracking of patients, social distancing, isolation wards, and now vaccines are been bought from Russia, China, and
U.K with efficacy level of 70-79%. The strict steps have been taken by Government for closure of markets, educational institutes and public places. Later, the Central Emergency Relief Fund (CERF) has allocated approximately $60 million for public (Waris et al., 2020; Deutsche Welle 2021). But unfortunately, the fund couldn't accommodate all and thus the Government
decided to go with the smart lockdown. During this time Pakistan bears severe economic loss. Moreover, the insufficient resources, poverty and hunger faced by daily-wage workers are the real challenges. The complete shutdown makes the life miserable for many daily wages earners. This critical situation causes death either from virus or from hunger (Wibawa, 2020).

3.3 : Adoption of COVID-19 Vaccines by the Government of Pakistan Since December 2020, developed countries secured COVID-19 vaccines for their public and started to provide jab with their proper health-care strategies. Pakistan is one of the countries that are still lagging to secure vaccines for its people. According to Pakistan's strategy for initiation and selection of COVID-19 vaccines, it is stated by Federal Minister of NHRC that registration for COVID-19 vaccines is only open for first-line health-care workers. People of age 65 and above will be going to receive vaccines shots by March (NDMA, 2021). Currently, Pakistan Drug Regulatory Authority (DRAP) approves four COVID-19 vaccines from three separate countries including, China, U.K and Russia. Government of Pakistan has established National Command and Operation Centre (NCOC)to assist in the adaptation and implementation of the decisions by national coordination committee on COVID-19 (Waris et al., 2020; Deutsche Welle 2021). The most recent data of vaccines inoculation in Pakistan is shown in table 1 (see below).

Provinces and Federally Administrated Regions	No of Vaccine Centres	COVID-19 Vaccines Total Doses(On a day of March 17, 2021)
Punjab	189	118,000

Sindh	15	121,000
Khyber Pukhtunkwah	280	28,000
Baluchistan	44	16,000
Islamabad Capital Territory	14	15,200
Azad Jammu Kashmir	25	11,000
GilgitBultistan	16	5000

Table 1. Province-wise vaccine centers and vaccine dosage on a certain day (March 17, 2021)

Pakistan allocated $150 million for COVID-19 vaccines and these vaccines would be bought from international pharmaceutical manufacturers. It is believed that Israel become first country who immunized there public (Ahmed et al., 2021). Israel selects BNT161B2 Pfizer vaccines and its efficacy rate is up to 95%. However, Pakistan decided to buy BBIBP-CORV Sinopharm (1.2 million doses) from Beijing and its efficacy is up to 79.3%. Moreover, another vaccine selected approved by DRAP is Oxford-AstraZeneca (17 million doses) and its efficacy rate is up to 70.4%.Government should pay heed towards the quality, efficacy and their overall results from other countries' clinical trials (Business Insider India, 2021; Coronavirus (COVID-19) Vaccinations - Statistics and Research 2021; Ahmed et al., 2021). The efficacy results in different countries are reported in figure 4 and table 4 (see below).

Countries	Vaccines Adopts	Efficacy Rate	Trial Phase
UK, Canada, KSA, Israel, Singapore, EU, Mexico, Serbia, Kuwait, Chile, Latam, Qatar	BNT161B2 Pfizer + BioNTech	95%	Trial Phase 2/3
USA & Canada	MRNA1273 Moderna	94%	Trial Phase 3
Russia, Belarus, Algeria	SPUTNIK V Gamaleya	91.4%	Trial Phase 3
China & Turkey	CORONAVAC SINOVAC BioTech	50%	Trial Phase 3
India	COVAXIN Bharat BioTech	80%	Trial Phase 3
China, UAE, Bahrain, Jordan, Seychelles , Pakistan	BBIBP-CORV Sinopharm	79.3%	Trial Phase 3
India, U.K, Thailand, Pakistan	CHADOX1/AZD1222 + Oxford University + AstraZeneca	70.4%	Trial Phase 3
China –approved for military use only	AD5- NCOV CanSino Biologics + The Military Institute of Biology	75% (effective to prevent disease)	Trial Phase 3

Table 2. The vaccines efficacy and its utilization by different countries

4: Scientific Knowledge on Health Issue: A Blurred Picture by Embedded Myths in Society

1.1. Myths and Health Care: A General Prevalence

The healthcare delivery system of Pakistan is complex because it includes healthcare subsystems by federal and provincial governments competing formal and informal private sector healthcare systems (Kurji et al., 2016). In this pandemic period, tracking, testing and smart lockdowns should focus in densely populated areas of Pakistan. So, in this regard, federal and provincial healthcare monastery put forward various strategies to mitigate the severity of

pandemic fatal impacts. Along with combating COVID-19 pandemic, different myths has been neg: tively engulfing the society of Pakistan especially in the rural communities. Prior to pandemic and till now, it is the matter of concern that various myths circulates and reinforce the explicit violation of healthcare strategies (Khan et al., 2012). The significantly higher rate recorded of illiteracy in Pakistan that causes the dissemination of myths, false beliefs and pessimist perception towards modern healthcare strategies (Khalid and Ali, 2020).

4.2 : Myths and Response to COVID-19

The presence of reinforcing myths in the society is a major cause that fatal diseases and disabilities are still prevailed in rural areas. The behavior of people towards vaccines inoculation is quite controversial or explicit. This is not the current issue but it is the most prior and stringent belief to avoid vaccines to inoculate to immune-comprised patients and public who are under threat of fatal diseases such as Polio, dengue and corona virus. Pessimist perception and fabricated myths are threatening scenario in Pakistan because of limited awareness and false religious beliefs. The people of rural areas are the real sufferers of such falsify beliefs. Majority of rural citizens prefer to go spiritual healers and non-formal health practitioners for the treatment or adopt spices and organic food in their diets to prevent diseases. The public behavior towards treatment of their disease or vaccination inoculation are badly impacted by the myths, misconception, falsify beliefs, illiteracy, socio-culture and religious barriers. Such myths are adopted from ages and now new myths are been constructed with vaccines of COVID-19. The most related myths circulating are general myths that are adopted because of unawareness, the doubt on credibility of institutes and fixated orthodox mindsets (Atif et al., 2017).

Consequences of Publicized Myths

The very nature of the myth is that it gets publicized widely in a very short time and people tend to follow a myth without questioning its authenticity for evidence for/against a myth (Sahoo et al., 2020). For instance, various Hepatitis patients directed by their elders and non-formal health practitioners to eat boiled food and forbid them to eat fish, meat and milk. In reality, these entire food items helps to develop immune system and are rich in proteins and vitamins but it can't be consider remedies for Hepatitis disease. Specifically majority of women and children suffer, during pre- and postnatal period, from the consequences of myths in rural areas of Pakistan. Moreover, misusing religion to prescribe the wrong remedies by non-formal health practitioners for personal gain is common that leads the fatal and irreversible results on public health (Qureshi and Sheikh, 2006). Various vaccinators and non-government organization face severe threatening condition but still they are working on eradication of Polio from the country (Andrade and Hussain, 2018). Most recent, COVID-19 vaccines are negatively targeted by new circulating myths such as COVID-19 vaccines are causing death, abnormalities and infertility in human to control population.

5: Research Design: Explore Gap between Science and Society Using Myths about COVID-19

The research design of this study is sequential exploratory (see figure 5).Exploratory sequential mixed methods is an approach to combining qualitative and quantitative data collection and analysis in a sequence of phases (Creswell, 1994). Four data collection techniques were used: (i) informal interviews (ii) first Survey (iii) second Survey (iv) in-depth interviews from the selected respondents classified from the survey. A list of eight myths compiled by conducting informal interviews from general public having diverse socio-demographic, cultural, ethnic backgrounds e.g. maid servants are interviewed from each province i.e. Hyderabad, Bahawalpur, Peshawar, Quetta. Similarly, bank officers are interviewed from Dadu, Lahore, Islamabad, Khuzdar. Also to cover religious beliefs, Christian, Hindu and Muslims (i.e. Sunni and Shia) were included, purposefully, among the respondents. Author (s) takes the benefit of their diverse social circles to compile interviews and survey (s) questionnaire.

A questionnaire of first survey developed with four sections (i) socio- demographics (ii) an acceptance/ or complete denial of the existence of COVID-19 (iii) awareness level (lower, good, higher) about the nature and prevention from COVID-19 (iv) myths about COVID-19.In the first survey, during March

2020, 338 responses were collected from a diverse set of respondents (see fig 3).The division of sample by age wise distribution in five category become convenient to analyze their perception towards revolving myths (see table 3).

Age Group				
Below 20 years	21-30 years	31-40 years	41-50 years	50 years or above
14.7%	32.5%	29.5%	8.2%	7.6%
50	110	100	28	26

Table 3.The age wise distribution and responders of n=338.

With respect to public perception towards myth it is necessary to consider their occupation and education level to interpret that is there interconnection between society's perceptions towards circulating Myths on the basis of their occupation and education-level. (See figure 3)

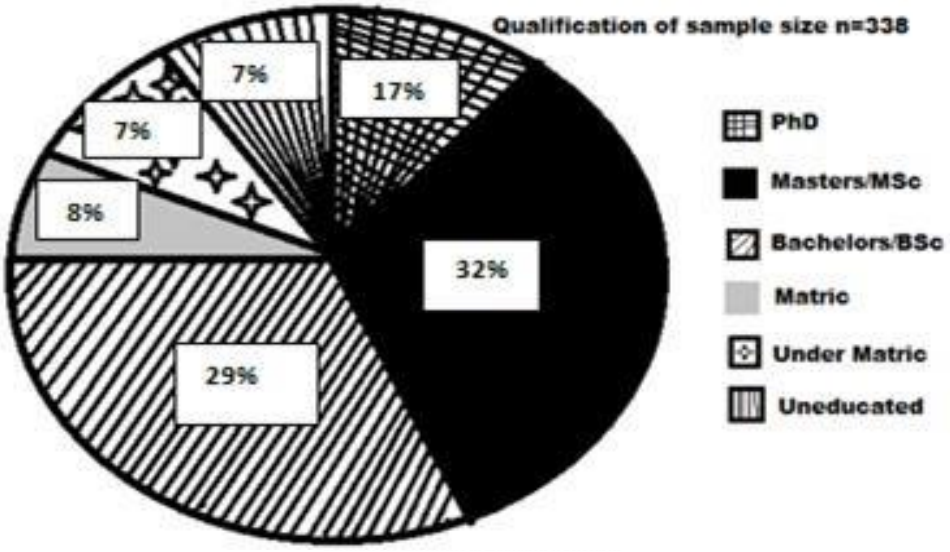

Fig 3.The division of sample qualification-wise

The questionnaire of second survey was designed to investigate myths regarding vaccines of COVID-19, adopted by Pakistani Government. Second survey was conducted from March, 2021. Among the respondents, 45% responses are from female and 55% were recorded by male. The 32.50% respondents were uneducated while rest has different qualification ranges from PhD to primary school. The reason to analyze the sample into qualification-wise distribution is that people perceive differently depend on the qualification and education level and such distribution shows their various point of view towards myths of society. A complete list of investigated myths, of both surveys, is shown in the table 4.

Myths- First and Second Survey		
1	Bill-Gate want to insert a chip in all human being to get a control on them?	Yes/No
2	Is it a propaganda of Government to get money from international organization?	Yes/No
3	It is a propaganda of news channel to enhance their rating	Yes/No
4	Is it a disease of non-Muslim (i.e. Kafir)?	Yes/No
5	It's a propaganda of west to distance us from our religious and cultural rituals	Yes/No
6	Our food and drink (spices and tea) save us from virus	Yes/No
7	This disease is only for sinners that belong to developed countries and it is proved from a high death rate in these countries	Yes/No

8	Doctors insert a poison injection to corona patient on a visit to hospital?	Yes/No
9	virus is a deliberate creation to achieve some global-level issues (e.g. Change world order, Ozone layer depletion, introduce 5G robots)	Yes/No
10	Pakistan's adopted vaccines are insecure as compare to other countries	Yes/NO
11	COVID-19 vaccines creates sudden death	YES/NO
12	The inoculation of vaccine creates clotting of blood and cardiac arrests	YES/NO
13	Are Vaccines causes infertility to control population?	YES/NO
14	COVID-19 vaccine develops severe adverse effects on health	YES/NO
15	Are Vaccines of COVID-19 designed to insert chip in human to track the daily activity?	YES/NO
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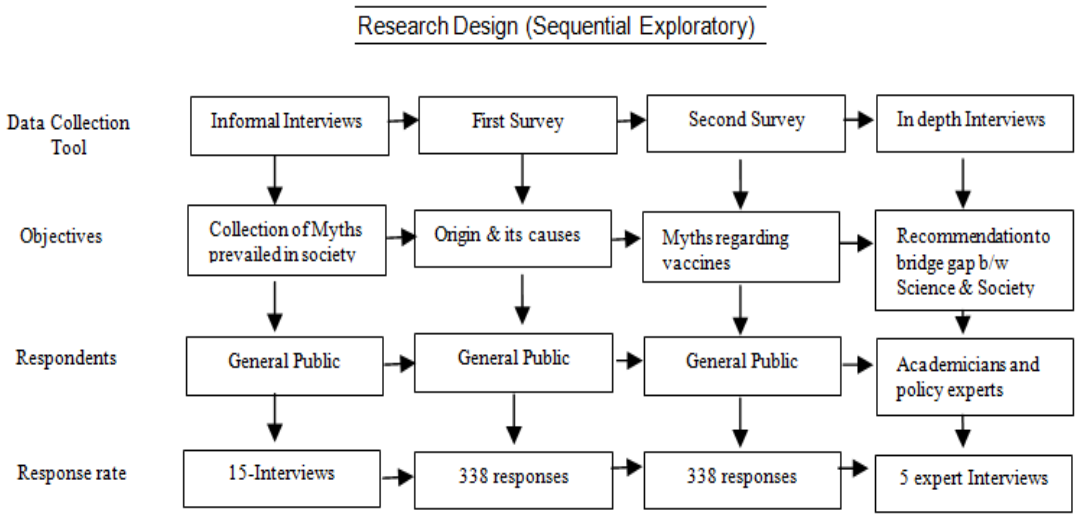

Fig 4. Research Design (Sequential exploratory)

6: Research Results and Analysis

6.1 : Myths of COVID-19 origin and Vaccine Resistance

A very first basic question in the survey was —does Corona virus is falsity (Jhoot[1])?‖ to investigate immediate understanding of virus in public. The support to falsity by 29% of respondents was quite surprising because during this period infections and death rate was approaching to its peak. The survey was responded by 43.1% males and 58.9% female and age group of 31-40 record maximum response.

In both surveys, respondents were belonging to different occupations. At least 28.4% were students, 7.6% were domestic labors, 12.4% were academic serving officers, 3% were managers, almost 4% were professional engineers, 5.3% maid servants and social workers, 5% were business person, 8.3% were government employees, 2.3% were marketer, researchers and Analyst, 4% were labors, 2% were doctors, 1% were lawyers, 2% were environment specialist and pharmacist, 3% were unemployed and 1% were retirees from a total 776 sample.

In the awareness section of the questionnaire, an open question was asked to record the perception about Corona. When the responders were asked what's your perspective regarding corona virus? you know and what your perception about this Corona? We have found following results. The 72.57% respondent perceives CORONA as a disease or type of disease. While 27.18% respondent think CORONA is not a disease at all but it is a fallacy or biological war or even some respondents have no idea about it (see table 4 below).

Perception of responders to CORONA								
Diseas e	Plagu e	Virus	Pandemi c	illnes s	flu	nothin g, fallacy	Biologic al war	No Ide a
84	30	34	28	28	42	52	30	10
24.80%	8.80 %	10.05 %	8.20%	8.20 %	12.42 %	15.38%	8.80%	3%
Disease						**Not a disease**		

Table 4. Respondent perception to CORONA

Awareness-level (Question 2-8) of Respondents

For analysis, survey's response of myths is further ranked according to three different awareness levels of respondents, i.e.low, good and higher. In the first survey, respondents were also assessed regardingtheir general awareness about COVID-19. Research recorded 72.7% respondents discern that corona is a disease whereas at least 27% respondents consider it as not a disease.

Jhoot is an urdu word meaning falsity. Since the first case reported in Pakistan, a most common and public sentence was "Corona is Jhoot". Every second person in public places uses this sentence to justify his SOPs violation behavior.

Respondents with opinions that Corona is a disease, their responses to seven questions, about awareness-level, are further assessed. Research calculated low-level awareness level on the basis that 47% respondents do not read newspapers, and at least 45% are not aware about wearing face mask can prevent the spread of virus. Moreover, good-awareness level (at least 86%) judge according to respondents' well-awareness about social distancing, social media awareness campaigns and that they don't need to go outside from their premises during this pandemic. Furthermore, 92% of respondents are well-aware regarding washing hands frequently help to protect from COVID-19 virus.

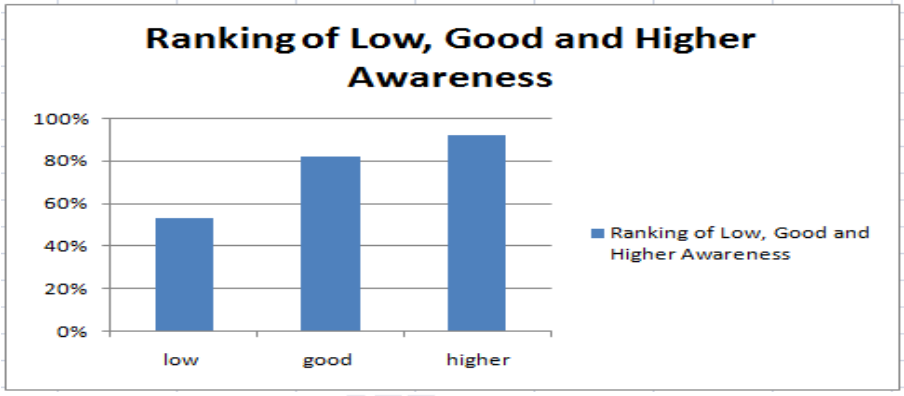

Fig 5. Ranking of Low, Good and Higher Awareness about Disease and its prevention method

6.2 Classification of Myths

Firstly, research classifies the myths based on the acceptance and denial group of respondent of the first survey. Secondly, it ranks the myths 1 to 8, based on the response of three different subgroups having awareness levels, i.e. low, good and higher. Thirdly, it shows a ranking of the myths 9 to 15 about the efficacy of vaccine collected from the respondents of the second survey. Figure (7) shows the ranking of myths from the both groups i.e. one group believes that Corona is a falsity while the other accept that it is something that exists. Maximum respondent, in a complete denial state, believe that ―It is the propaganda of news channel to enhance their rating (myth 3)‖, While the group, in the acceptance state, believe that ―Bill gates want to insert a chip in all the human beings, especially poor country like Pakistan, to get a control of them (myth 1)‖

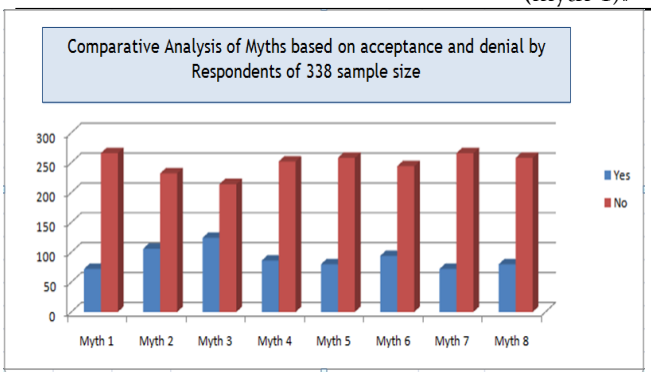

Fig 6. Comparative Analysis of Myths based on

acceptance and denial by Respondents of 338 sample size

In figure 7, largest number of respondents in acceptance state with ―higher awareness level ―are of the opinion that ―it's propaganda of west to distance us from our religious rituals (myth 5)‖. Second largest respondents of this level believe ―this disease is only for sinners that belong to developed countries and it is proved from a high death rate in these countries (myth 7)‖. Third majority feel sure that ―our food and drink (spices and tea) save us from virus (myth 6)‖. This myth is deep rooted in the societies of Pakistan and India also to prevent and cure of other diseases. This fallacy proves to be dangerous when a patient do not opt a proper medical treatment but heavily rely of specific food and drink.

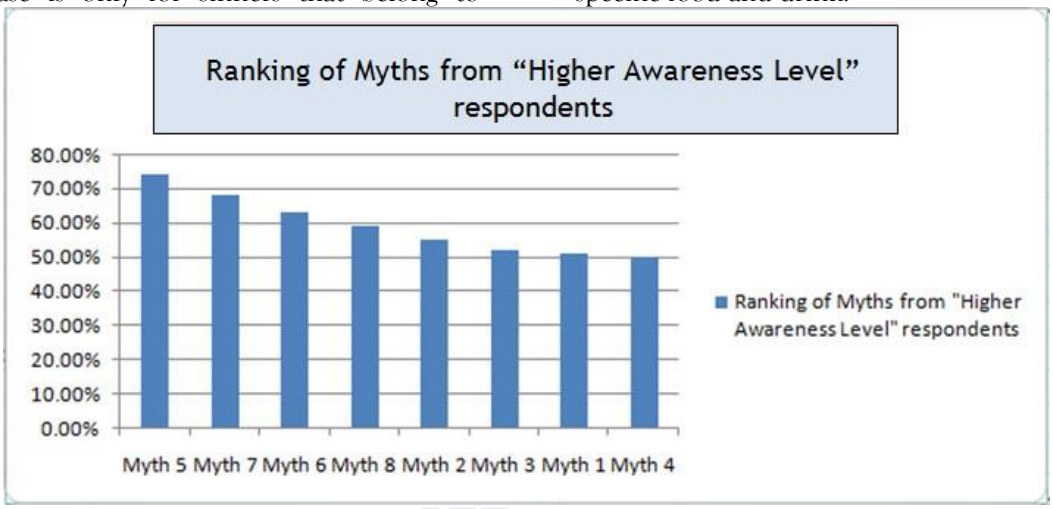

Fig 7. Ranking of Myths from ―Higher Awareness Level‖ respondents

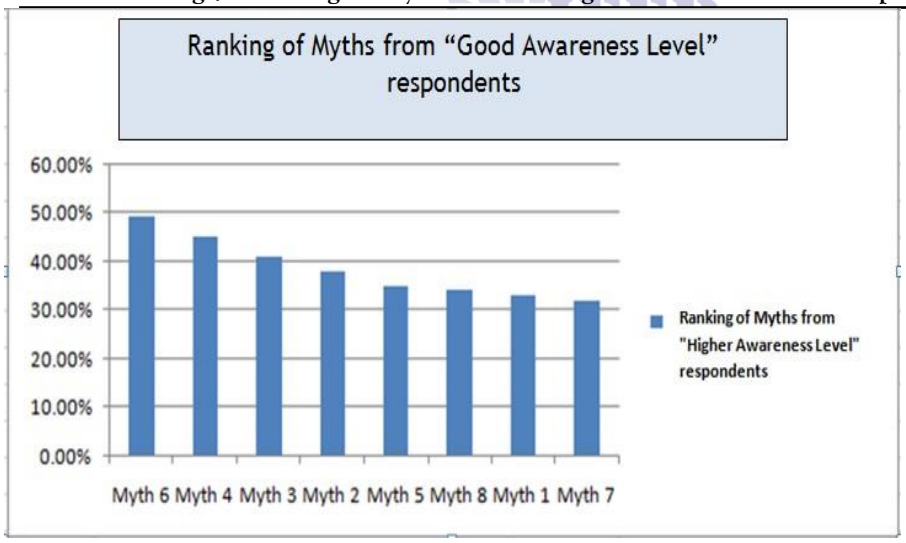

Fig 8. Ranking of Myths from ―Good Awareness Level‖ respondents

In figure 09, respondents in acceptance state with ―low awareness level‖ are of the opinion that ―It is propaganda of news channel to enhance their rating (myth 3)‖ and secondly they think that ―our food and drink (spiced and black tea) save us from this disease (myth 6)‖. The third most prevalent myth is ―it is a disease of non-Muslims (myth 4)‖. Prevalence of myths can easily be observed in cultural and religious rituals and ceremonies, in almost every part of the country.

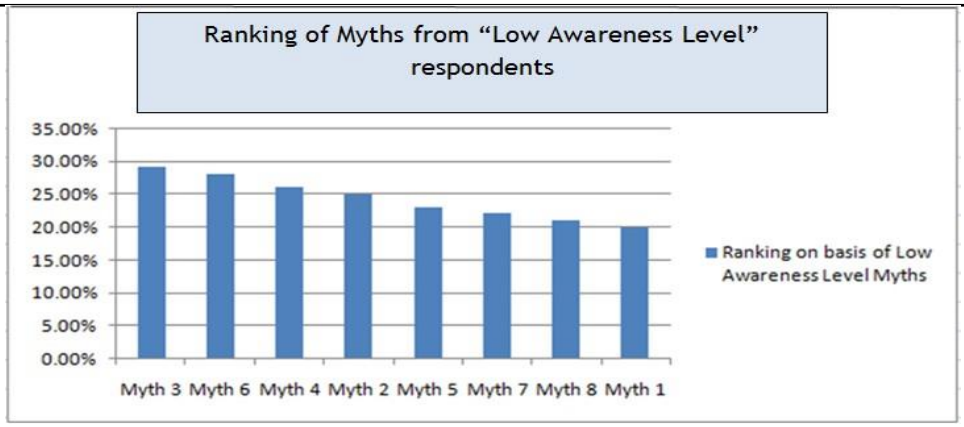

Fig 09. Ranking of Myths from ―low Awareness Level‖ respondents

When have asked from public about the COVID-19 vaccines adopted by Pakistan then around 69% of people clearly said the decision is uncertain and we don't know about its side-effects or adverse effects of COVID-19 vaccines. At the other hand, only 18% people think that the choice is good to select Oxford-AstraZeneca, Sinopharm, while 13% people have no comments regarding vaccines. The majority of respondents, from second survey (see figure 10) believe that ―Pakistan's adopted vaccines are insecure as compare to other countries (myth 10)‖, and secondly they believe ―COVID-19 vaccine develops severe adverse effects on health (myth 14)‖ and third prevailed fallacy is ―virus is a deliberate creation to achieve some global-level issues, e.g. change world economic order, introduce 5G robots, reduce ozone layer depletion…(myth 9). The fourth most prevailed assumption in public is ―the inoculation of vaccine creates clotting of blood and cardiac arrests (myth 12)‖.

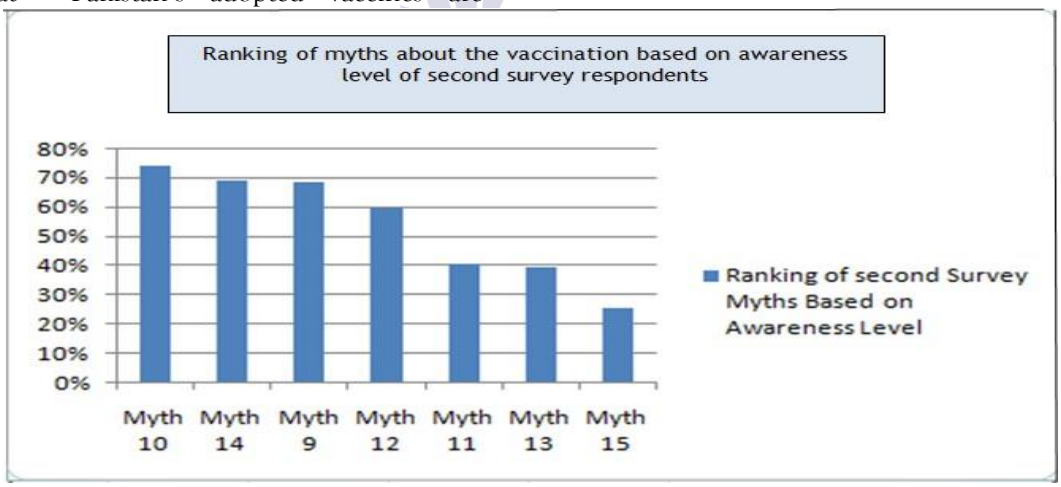

Fig 10. Ranking of myths about the vaccination based on awareness level of second survey respondents

6.3 Evidence of Gap between Science and Society

Researchers (Sarewitz and Pielke 2007) develop the ―missed opportunities‖ matrix to reconcile the supply and demand of the scientific knowledge. The upper right and lower left quadrants indicate where opportunities to connect science and users have been missed. The identified myths, based on the lacking of supply and demand of scientific knowledge, are placed in the missed opportunities cells of matrix. Further, myths that are rated higher by different categories of respondents are formatted as bold. The result of this research confirms the argument raised by previous research that scientific priorities and social needs are poorly aligned in a number of critical areas. Most health research is carried out in affluent societies and responds to the health needs of affluent people has resulted in an increasingly wide gap between science agendas and global health priorities

		Demand: Can Users Benefit from Research?	
Supply: Is Relevant Information Produced?		Yes	No
	Yes	Empowered users taking advantage of well- developed research capabilities	12 4 5 78 15(Unsophisticated and marginalized users, institutional constraints, or other obstacles prevent information use)
	No	3 6 9 1011 12 13 14(Research agenda may be inappropriate)	Research agendas and user needs poorly matched, users may be disenfranchised

Fig 11. Missed-opportunities matrix (Sarewitz and Pielke 2007) with an evidence of societal myths about Covid-1

Missed Opportunities-Research Priorities Need Modification (lower- left)

If an assessment of demand (societal response) reveals that certain classes of users could benefit from a type of information (public health) that is not available currently (lower left), then this is an opportunity – if the provision of the information is scientifically, technologically and institutionally feasible. The following classified myths report that current research agenda of medical science and public health is inappropriate and is not matched up with the demand of users.

- It is a propaganda of news channel to enhance their rating (myth 3)
- Our food and drink (spices and tea) save us from virus (myth 6)
- virus is a deliberate creation to achieve some global-level issues, e.g. change world economic order, introduce 5G robots, reduce ozone layer depletion……)(myth 9)
- Pakistan‘s adopted vaccines are insecure as compare to other countries (myth 10)
- COVID-19 vaccine develops severe adverse effects on health (e.g. nausea, high fever, renal failure ….) (myth14)

The reported myths lead to conclusion that the conspiracy theories about developed countries and media also contributed to the rejection of the scientific explanation of the origin and vaccine of COVID-19. The myths also reflect the wrong mindset of people and further thinking it right based on non-scientific reasoning. Scientific community dealing with nutrition science, virology, medical science and media making a progress to enhance the knowledge in their respective fields but the societal response shows that the society, at a general level, is unaware of basic knowledge of these fields. Research results is a throwback that scientific community has not paid an attention to unpack these misconception of common people that are embedded in society due to the presence of non-scientific knowledge. Neither, science agenda remain focused that application of basic science knowledge only works when the users have an understanding of the origin of knowledge. Research results confirms that preventive scientific information competes in people‘s minds with other beliefs and practices and it inform policy makers that a mismatch exists between the production and need of scientific knowledge. The field of medical science has research opportunities to bridge this gap according to the awareness and education level of the society.

Missed Opportunities-Research Priorities Misaligned (upper-right)

The scientific community supplies the knowledge but a demand of knowledge is absent because the recipients are marginalized and unsophisticated users. Also institutional constraints or other obstacles prevent information use. The following high graded myths are reported as missed opportunities (upper-right) cell in the framework:

- Bill gates want to insert a chip in all the human beings, especially poor country like Pakistan, to get a control of them (myth 1)
- It is a disease of non-Muslims myth 4
- it‘s a propaganda of west to distance us from our religious rituals (myth 5)
- This disease is only for sinners that

belongs to developed countries and it is proved from a high death rate in these countries (myth 7)

The reported understanding on the very nature of COVID-19 reflects a complex nature of religious and cultural beliefs about a critical health issue in a conservative society. The emerging picture becomes more complex when these beliefs amalgamate with the suspicion, in the minds of people, about the health science agenda of international organizations. The above pervasive belief in society reports that the relationship between science and society is undergoing significant stress. The strain reflects in the attitude of society in public places, processions and gatherings through their denial to follow the SoPs of COVID-19. Even the government imposed restriction are portrayed negatively which is contributing to worsen the situation. Partial restrictions, by government, to limit religious ceremonies and rituals turned religious conservatives uncomfortable. The nature of above myths shows how non- scientific knowledge is driving the mindset of people on a public health issue. It also evident that medical community is enmeshed in continuing battle to keep the nature of science clears in debates. The nature of myths says the potential for science to contribute societal goals depends critically on factors well beyond science. The science community does not find an institutional network structure where the facts of science can be delivered. The danger with myth is that it becomes public in no time. The current societal response is elusive that our society, as a whole, is at a stage where science and technology needs to change the society. Dialogue on science, ethics, and religion brings scientists together with religious leaders and ethicists to discuss scientific advances and how they relate to other beliefs and value systems.

7: Conclusion & Discussion

Since the start of COVID-19 in Pakistan, there is a sharp division of public in their response towards the acceptance and denial of Corona virus. From the very beginning, different myths associated with the origin, prevention and spread of virus are developed in general public. At a superficial level, the development of myths can be attributed to a less educated population and lack of trust in the credibility of institutions i.e. social media, government health services and government of Pakistan. An established societal belief ―Corona is falsity‖ is reflected in society's response towards the government restrictions

e.g. no mask wearing, do not follow social distancing, no use of disinfect, celebrating cultural and religious gatherings. Keeping in view the economic condition of Pakistan as well as emotionality and religiosity of public to perform their rituals, government divert from a complete lockdown in the country. Ministry of NHRS has provided the guidelines on each religious festival but a complete denial and violation of SoP's remain prevalent among public.

An evidence of this study shows that STI policies of Pakistan, generally, are not society inclusive and policy objectives are not dealing with the societal issues that can actually be resolved through science and technology. Neither the policy development process is evidence-based. A large proportion of public, consisting of unsophisticated and marginalized users are never remain inclusive in policy design. This research hypothesized that the response of society towards COVID-19 provides an evidence of the gap between science and society and the assessment of myths revealed that it is true.

To provide evidence, this study conducts two surveys to collect the myths from the society about the origin, prevention and vaccine of COVID-19. Also informal interview for the development of questionnaire and few expert interviews conducted to unpack the underlying beliefs behind the myths to draw policy implications for the forthcoming ST&I policy of Pakistan. Using the framework of (McNie, 2007 Sarewitz and Pielke 2007), map the supply and demand of scientific knowledge; the identified myths are categorized to identify missed opportunities that arise either research opportunities need modification and research priorities misaligned. This evidence of prevailed myths about COVID-19 gives an evidence of the gap between science and society. The production of scientific knowledge needs to accompany with the unpacking of non-scientific knowledge for the users. The very nature of myths shows that these are based on irrational mindset derived by non-scientific knowledge floats through thoughts in public.

An expert interview reveals that existing gap between science and society can be bridged by participation of all stakeholders in policy making process. The current limited involvement of religious leader in policy making process does not have an effect in entangling this complex gap of science and society. For the agenda setting of science, evidence is needed to be collected on a regular basis from the users regarding their issues concerned with science. Current academic research needs be issue based and follow the science priorities set by policy makers and users. Policy dialogue needs to be regular part of the different disciplines especially the medical fields. Public health program need to be designed by community participation and should be based on the issues that are related with perceptions and health of general public. The research agenda of the science should be designed by inclusion of community. The myth about scientific knowledge needs to be resolved through an active participation of scientists, religious leaders, healthcare professionals and Government. Therefore, a proper and planned awareness program taking into account all the stakeholders is the need of the hour, which can help change society's outlook from following the unhealthy/unacceptable norms/myths to acceptable/healthy evidence-based norms. Last, but not least, this study endorses (Leshner, 2003) finding that ―historically science and technology have changed society; society now is likely to want to change science and technology, or at least to help shape their course‖

REFERENCES

Abid, K., Abdul Bari, Y., & Imran, A. (2020, May 1). *Progress of COVID-19 Epidemic in Pakistan*. PubMed Central (PMC). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7240311/#!po=35.7143

Andrade, G., & Hussain, A. (2018). Polio in Pakistan: Political, Sociological, and Epidemiological Factors. *Cureus: Publishing beyond Open Access*, *10* (10), 1–21. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6318131/

Atif, M., Azeem, M., &Scahill, S. (2017). *Investigation of antimicrobial use at a tertiary care hospital in Southern Punjab, Pakistan using WHO methodology*. PubMed Central (PMC). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5410053/

Business Insider India. (2021, January 27). *9 people died and 16 hospitalized out of 23, 28, 779 people vaccinated till now in India, but Additional Secret*. Business Insider. https://www.businessinsider.in/politics/india/news/9-people-died-and-16-hospitalised-out-of-2328779- people-vaccinated-till-now-in-india/articleshow/80485548.cms

Cash, D. (2001). In order to aid in diffusing useful useful and practical information: agriculture extension and boundary organizations. *Human Values*, *26* (2), 431–453. https://doi.org/10.1177/016224390102600403

C. McNie, E. C. M. N. (2007, February 1). *Reconciling the supply of scientific information with user demands: an analysis of the problem and review of the literature*. ScienceDirect. https://www.sciencedirect.com/science/article/abs/pii/S1462901106001201

Coronavirus (COVID-19) Vaccinations - Statistics and Research. (2021). Our World in Data. https://ourworldindata.org/covid-vaccinations

Creswell, J. (1994). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.

Desk, W. (2021, February 15). *COVID-19 vaccination: Registration of citizens over age of 65 begins across Pakistan*. The News International. https://www.thenews.com.pk/latest/790387-pakistan-starts-registering- citizens-over-age-of-65-for-coronavirus-vaccine.

Deutsche Welle (www.dw.com). (2021). *Fact check: Are COVID-19 vaccines causing deaths?* DW.COM. https://www.dw.com/en/fact-check-are-covid-19-vaccines-causing-deaths/a-56458746

Deutsche Welle (www.dw.com). (2021c, February 20). *Fact check: Are COVID-19 vaccines causing deaths?* DW.COM. https://www.dw.com/en/fact-check-are-covid-19-vaccines-causing-deaths/a-56458746

Dickinson, D. (2013). Myths or theories? Alternative beliefs about HIV and AIDS in South African working class communities. *African Journal of AIDS Research*, *12* (3), 121–130. https://doi.org/10.2989/16085906.2013.863212

Elizabeth C. McNie, Parris, A. P., & Sarewitz, D. (2015, February 14). *A Typology for Assessing the Role of Users in Scientific Research*. CSPO. https://cspo.org/research/user-inspired-research/a-typology-for- assessing-the-role-of-users-in-scientific-research/

FALADE, B. A. N. K. O. L. E. (2015). Familiarizing Science: A Western Conspiracy And The Vaccination Revolt In Northern Nigeria. *Papers on Social Representations*, *24*(3), 1–25. https://www.google.com.pk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjEtrr28fvvAhVKZMAKHfoLB0sQFjAAegQIAxAD&url=https%3A%2F%2Fpsr.iscte-iul.pt%2Findex.php%2FPSR%2Farticle%2Fdownload%2F121%2F85&usg=AOvVaw13cpAAc9sjEw6nZD 4ap-5j

Gul, B. A., & Tanzeem, B. A. (2021, January 30). *Pakistan Secures 17 Million Doses of AstraZeneca Coronavirus Vaccine*. Voice of America. https://www.voanews.com/covid-19-pandemic/pakistan-secures- 17-million-doses-astrazeneca-coronavirus-vaccine

Health, Health, S., Ahmed, T., & T. (2021). *COVID-19 vaccine updates in Pakistan and around the world | SAMAA*. Samaa TV. https://www.samaa.tv/news/2021/02/covid-19-vaccine-updates-in-pakistan-and- around-the-world/

It works: 0 deaths, only 4 severe cases among 523,000 fully vaccinated Israelis. (2021, February 20). The Times of Israel. https://www.timesofisrael.com/hmo-sees-only-544-covid-infections-among-523000-fully- vaccinated-israelis/

Jamil, B. (2020). *Clinical features, diagnosis and management of COVID-19 patients in the outdoor setting*. JPMA- Journal of the Pakistan Medical Association. https://www.jpma.org.pk/supplement-article- details/478.

Khalid, A., & Ali, S. (2020). COVID-19 and its Challenges for the Healthcare System in Pakistan. *Asian Bioethics Review*, *12*(4), 551–564. https://doi.org/10.1007/s41649-020-00139-x

Khan, S., Manohar, N., & Bilal, S. (2012). Perceptions and myths regarding oral health care amongst strata of low socio economic community in Karachi, Pakistan. *Journal of the Pakistan Medical Association*, *62* (11), 1198–1203. https://www.researchgate.net/publication/250917987_Perceptions_and_myths_regarding_oral_health_care_amongst_strata_of_low_socio_economic_community_in_Karachi_Pakistan

Khaula, A., Naqvi, S., Naqvi, S., Ehsan, K., Niazi, S., & Annam, J. (2017). Reproductive health issues in Pakistan; do myths take precedence over medical evidence? *Journal of the Pakistan Medical Association (JPMA)*, *67* (8), 1–10. https://jpma.org.pk/article-details/8317?article_id=8317

Kiani, K. (2020, December 12). *Pakistan signed up for $10.5bn foreign loan in FY20*. DAWN.COM. https://www.dawn.com/news/1595249.

Kurji, Z., Premani, Z.S., &Mithani, Y. (2016). Analysis Of The Health Care System Of Pakistan: Lessons Learnt And Way Forward. Journal of Ayub Medical College, Abbottabad (JAMC), 28 (3), 601-604.

Leshner, A. I. (2003). Public Engagement with Science. *Science*, *299* (5609), 977. https://doi.org/10.1126/science.299.5609.977

Ministry of National Health Services Regulations & Coordination. (2021, February 18). *COVID-19 Situation By Government of Pakistan*. Ministry of National Health Services Regulations & Coordination: COVID-19 Statistical Data. https://covid.gov.pk/

National Disaster Management Authority Pakistan. (2021). *NDMA*. http://www.ndma.gov.pk/

Naqvi, A. A., Naqvi, B. S., Yazdani, N., Ahmed, R., Ahmed, N., & Zehra, F. (2017). Understanding the Dynamics of Poliomyelitis Spread in Pakistan. *Iranian Journal of Public Health*, *46*(7), 997–998. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5563886/

News Desk. (2021, February 15). *Pakistan to get 17m Covid-19 vaccine doses by April*. The News International. https://www.thenews.com.pk/print/790314-pakistan-to-get-17m-covid-19-vaccine-doses-by- april

Pakistan Coronavirus: 692,231 Cases and 14,821 Deaths - Worldometer. (2021). Worldometer. https://www.worldometers.info/coronavirus/country/pakistan/

Pakistan says $150m allocated to buy COVID-19 vaccine from. (2020, November 13). Arab News. https://www.arabnews.com/node/1762681/world

Qureshi, N., & Shaikh, B. T. (2006). Myths, Fallacies and Misconceptions: Applying Social Marketing for Promoting Appropriate Health Seeking Behavior in Pakistan. *Anthropology & Medicine*, *13* (2), 131–139. https://doi.org/10.1080/13648470600738716

Sarewitz, D., & A. Pielke, R. A. P. J. (2007, February 1). *The neglected heart of science policy: reconciling supply of and demand for science*. ScienceDirect. https://www.sciencedirect.com/science/article/abs/pii/S Sahoo, S., Padhy, S. K., Ipsita, J., Mehra, A., & Grover, S. (2020). Demystifying the myths about COVID- 19 infection and its societal importance. *Asian Journal of Psychiatry*, *54*. https://doi.org/10.1016/j.ajp.2020.102244

Sola Morales, S. (2013). Myth and the Construction of Meaning in Mediated Culture. *KOME*, *1* (2), 33–43. https://doi.org/10.17646/kome.2013.13

Waris, A., Atta, U. K., Ali, M., Asmat, A., & Basit, A. (2020). COVID-19 outbreak: current scenario of Pakistan. *New Microbes and New Infections*, *35*, 1–5. https://doi.org/10.1016/j.nmni.2020.100681

Wibawa, T. (2020). COVID-19 vaccine research and development: ethical issues. *Tropical Medicine & International Health*, *26*(1), 14–19. https://doi.org/10.1111/tmi.13503

World Health Organization. (2021, March 30). *Home*. World Health Organization (WHO). https://www.who.int/

Zhaori, G., Lu, L., Liu, C., &Guo, Y. (2020). Progresses in clinical studies on antiviral therapies for COVID-19—Experience and lessons in design of clinical trials. *Pediatric Investigation*, *4* (4), 263–274. https://doi.org/10.1002/ped4.1222.