https://doi.org/ 10.48047/AFJBS.6.5.2024. 11283-11297

African Journal of Biological Sciences

Is there hesitancy towards COVID-19 vaccination among rural agricultural workers of central India: A cross-sectional study

Authors:

1. Madhur Gupta - MD, DNB, Professor & Head, Department of Biochemistry, NKPSIMSRC & LMH, Nagpur (M.S.) India. Email ID: madhurgupta1972@gmail.com, Orcid ID: 0000-0001-7991-8145
2. Srushtee Bhaiswar, Medical Student, Medical Student, NKPSIMSRC & LMH, Nagpur (M.S.) India. Email ID: srushteebhaiswar@gmail.com, Orcid ID: 0009-0009-2991-669X
3. Arti Kasulkar – MD, Professor & Head, Department of Forensic Medicine, NKPSIMSRC & LMH, Nagpur (M.S.) India. Email ID: artinarde@rediffmail.com, Orcid ID: 0000-0002-4869-3008
4. *Harsh Salankar – MD, Professor, Department of Pharmacology, NKPSIMSRC & LMH, Nagpur (M.S.) India. Email ID: harshsalankar@gmail.com, Mob. No. +91 8889500320. Orcid ID: 0000-0002-8747-6794

Article History
Volume 6, Issue 5, 2024
Received: 22 May 2024
Accepted: 03 Jun 2024
doi: *10.48047/AFJBS.6.5.2024.11283-11297*

Abstract:

A massive vaccination drive is initiated so that herd immunity is developed and the population at large is prevented from the side effects of the disease. However, the success rate of vaccination is facing several challenges. A cross-sectional study was carried out in rural population in central India to assess the extent of vaccine hesitancy, knowledge and attitude regarding vaccination. After consent, interviews were taken face-to-face and a structured questionnaire was administered to the participants. Of the 170 participants 158 (92.9 %) were aware about the existence of COVID-19 vaccine. 68.2% believed that vaccination is essential to stop COVID-19 pandemic whereas 49.35% were willing to get vaccinated. A greater number of males were vaccine hesitant as compared to females. The maximum hesitant participants were farm workers and had an educational qualification below 10^{th} class. The side effects caused by the vaccine were the major concern for vaccine hesitancy (43.8%). The study shows a strong positive correlation between knowledge, attitude and vaccine acceptance indicating that proper knowledge and communication as regards to COVID-19 vaccination can be associated with a significant impact on combating the disease.

Keywords: COVID-19, Vaccine, hesitancy, rural population, educational qualification, pandemic, side effects.

Introduction:

Vaccination against any virus has been a critical tool for controlling the disease. (Stamatatos *et al*., 2021; Cavanaugh *et al*., 2021), however its accomplishment faces several challenges. One of the major barriers lies in pessimistic public opinion and false propaganda about vaccination. WHO has defined vaccine hesitancy as the refusal or delay in vaccination (Machingaidze *et al*., 2021). The major grounds for this behavior are uncertainty about the safety of the vaccines, a short of knowledge about the importance of vaccination and misinformation fuelled by bad experiences of other people and media, among many others (Wong *et al*, 2021)

As vaccine hesitancy issues are rising globally, WHO recently recognized non-vaccination as one of the major global health hazard. A community-based study has found that population aspiration to get vaccinated against the virus has fallen noticeably, withover half of the populace hesitant or disinclined to get vaccinated (Daly *et al*, 2020). This issue seems to be worse among rural populations; firstly India is an agrarian country with a maximum residing in rural areas; secondly, the lack of major sources of information (such as the internet) results in a far lesser reach of knowledge in rural areas as compared to urban counterparts. Inaccessibilityof official sources can lead to spread of forged information which may be responsible for either prevalence of incorrect safety practices that can compromise the health of the population; and /or hesitation towards vaccination. (Mannan *et al*., 2020) and thirdly, a lack of understanding and poor living conditions puts the rural population at a high risk for communicability of infection. This situation is made worse by the lack of appropriate medical facilities in the form of care and resources thus precipitating a major public health crisis. A similar pattern in our country however, it may represent a much more enormous issue since 65% of the population is rural. Studies indicate that only a small proportion of the 12.2 crore Indians that have been vaccinated consists of rural citizens. A survey of vaccination drive in Ludhiana shows that till March 16 in the year 2021, the total number of people vaccinated inthe district stood at 72,364 of which only 7,111 belonged to rural areas. Similar data has been reported in several other states of India.

There exist significant information lacunae in perceiving the scope of vaccine hesitancy in the population and its causes. This is a relatively new concept and thus presents a vast scope for research and the threat that vaccine hesitancy poses to the much required quick and wide scale vaccination for combacting the virus.

Objectives:

1. Assess the extent of vaccine hesitancy and knowledge and regarding vaccination across various demographic groups in the selected rural population.
2. Assess the correlation of knowledge about COVID-19 vaccines and attitude towards vaccination.

Methodology:

Study design- IEC approved (NKPSIMS / IEC/ 07/2021 dated 26/06/2021) cross-sectional, observational survey was conducted with randomly selected adults.

Study population- The study was performed among the inhabitants of Mendki, a village in the Katol taluka, located 12 kms from the town. The village showed a population of 1476 (of which 766 were males and 710 females) as per Population Census 2011. The survey was conducted among individuals >/=18 years of age. The survey population consisted of 170 individuals (age range - 18-93 years; average age- 45.296; 56.3% males) which represents 12.3 % - 9.7 % of the total population. 42 % of the participants consisted of people involved directly in agricultural work, either as landowners or farm workers. Other occupations included day labourers (8 %), house help (6.8 %), small shop owners (4 %), business owners (1.1 %), students (9.7 %) and housewives (25 %).

Data collection procedure- Convenience sampling over the course of 2 months. The interviews were taken face-to-face after obtaining verbal consent, and information regarding voluntary contribution and anonymity about the responses was explained to the participants. The questionnaire was build up in English, and then converted to Marathi and Hindi which was then read out to each of the participants.

Data collection instrument- A structured validated questionnaire was prepared to assess attitude and knowledge regarding the project to be undertaken. This was modified and adapted from a model vaccine hesitancy survey questionnaire developed by the WHO SAGE working group (MacDonald *et al*.,2015) as well as other questionnaires that have been used to assess vaccination awareness and perception in various research studies. It comprises 36 questions divided into 4 areas of inquiry.

Data analysis- The data obtained from the interviews was entered into Excel sheet and subsequently exported for analysis. Population characteristics were reported as number of individuals, percentage, means and standard deviation. The demographic characteristics were considered as categorical variables for analysing their relationship with factors such as vaccine hesitancy, knowledge score etc. using Chi-square test. Relationship between quantitative variables

was studied by Student's T-test and ANOVA test. Statistical significance of p-value <0.05 was considered significant.

Result:

Participant characteristics:

Of the total estimated population of 1,432-1,801 in the village, 170 individuals (11.8%) were interviewed for the study. The mean age of the participants in the study was 45.26 (SD- 18.73) years. In the study, 56.21% of males had an educational qualification below 10th class (57.64%) and were involved directly in agricultural work (43.76%) either as land owners or farm laborers. 42% of the participants consisted of people involved directly in agricultural work, either as landowners or farm workers. The most common input of information about the COVID-19 vaccine was television (72%) (Table 1).

Knowledge:

Of the total participants 158 (92.9%) were aware about the existence of COVID-19 vaccine. The most recognized side effects by the respondents of the vaccine were fever (86.5%), pain at injection site (47.2%) and fatigue (38.7%). 15.3% of the participants believed that the vaccine causes a mild form of COVID-19 infection. The average knowledge score was 7.12 (SD 3.306). (Table 2).

Attitude:

The average attitude score was 12.48 (SD 4.66) out of a maximum of 20. Most of the participants (68.2%) believe that vaccination is essential to stop COVID-19 pandemic Participants with a willingness score below or equal to 3 were categorised as vaccine hesitant (Table 3).

Relationship between Knowledge and Attitude toward COVID-19 vaccination:

A strong positive association between knowledge and attitude with a score; t-value =12.143 and p-value <0.00001 is demonstrated (Graph 1).

Relationship of socio-demographic factors with knowledge and attitude:

The study demonstrates that attitude and knowledge scores were slightly on the higher side in males however the relationship is not significant (p-value > 0.05). Participants with an educational qualification below 10th class were found to have significantly lower knowledge and attitude scores. Participants working as house help and farm workers had the lowest scores, whereas land owners and students had the highest attitude and knowledge score (Table 4).

Vaccine hesitant population characteristics:

The socio-demographic composition of vaccine hesitant individuals was found to be similar to

that of the original survey population. A greater number of males were vaccine hesitant as compared to females. The maximum hesitant participants were farm workers by occupation and had an educational qualification below 10th class (Graph 2).

Relationship attitude, knowledge, and vaccine hesitancy:

A strong positive relationship was observed between attitude and vaccine acceptance (f-ratio value= 224.21, p-value <0.00001), and knowledge and vaccine acceptance (f-ratio value= 39.42, p-value <0.00001). The dependence of attitude on vaccinehesitancy was found to be stronger than that of knowledge.

Determinants of vaccine hesitancy:

The average score (max.= 8) of each determinant was obtained as follows: Contextual influences- 0.55 ± 0.98; Individual and group influences- 2.15 ± 2.35; Vaccine specific- 0.64 ± 0.97. A detailed assessment of each determinant is given. The participants who showed reluctance to get vaccinated were asked a preliminary question inquiring into the cause. The most common responses were "worried about getting side effects" (43.8%) (Graph 3).

Discussion:

Vaccination programs have helped in the annihilation of many infectious diseases. The proportion of immune individuals to reach herd immunity is said to vary from 50% to 90% across various countries in the world. (Kwok et. Al., 2020)

The increasing trend of vaccine hesitancy poses a great threat in the COVID-19 era. Studies have found that issues like the rapid manufacturing of the vaccine, apprehension about its plausible sideeffects, and the rise in conspiracy and assumptions worldwide are factors that contribute to lowering the COVID-19 vaccine acceptability. (Dror *et al*., 2020). This study conducted in a rural setup included a sample of 170 participants, of which 53% were willing to get vaccinated. The figure is lower than the estimated acceptance rate of the general population of India. However, this might be due to the significant proportion of highly educated people (85%) in the sample population which has been linked to higher vaccine acceptance. (Mohamed *et al*., 2021) 28% of the participants were reluctant to get vaccinated whereas 18.8% responded "not sure". The data is similar to that obtained from a study in rural areas of Tamil Nadu. (Danabal *et al*., 2021). There is no significant correlation of gender with vaccine hesitancy. But a higher rate of hesitancy has been found in the age group of 25-45 years in countries like USA. (Kreps *et al*., 2020).

The most frequently expressed reason for reluctance is concern about side effects (43%) and safety of vaccines (31.5%) which is consistent with surveys from other countries such as Uganda

and Sierra Leone as well as other studies on the Indian population. The results show skepticism about the effectiveness of vaccines in 57% of the hesitant population, similar to that in Mozambique, Pakistan and Russia. 29% of participants showed a preference to natural immunity rather than vaccines for development for immunity and had low apprehension to the adverse effects of the disease.

The sample population had a mean knowledge score of 7.12 (SD 3.3) from a maximum of 13. 62% of the population had a good knowledge score. The knowledge scores of males were found to be higher as compared to females in contrast to some other studies. (Al-Mohrej *et al*.,2016) High knowledge scores had a positive correlation with educational levels and income .(13) 87% of the participants were conscious of at least one of the side-effects of vaccination to the disease. About 5% of the participants believed that vaccination would lead to adverse effects such as paralysis or death.

The most common source of information was television (43.5%) followed by friends and family (68%) This suggests the great impact on health issues that can be made by the government and other organizations through public awareness campaigns. The average attitude score is found to be 12.48. The study shows that males have a slightly more positive attitude toward COVID-19 vaccines as compared to females. (Al-Hanawi *et al*., 2020) The reason could be that women are more apprehensive about undesirable side effects of the vaccine than actually contracting the disease. (Neumann Bohme *et al*., 2020) Participants with low education levels were found to have a negative attitude towards vaccination as seen in various studies. However, in participants with an education above class 10, the attitude scores remained similar with higher levels of education.

Conclusion:

Our study shows a strong positive correlation between knowledge, attitude and vaccine acceptance in the rural population which is consistent with the findings of several vaccine hesitancy studies from around the globe. This indicates that proper knowledge, education, and communication regarding vaccination which can lead to enforcement of practice can have a significant impact on combating the disease.

References:

- Al-Hanawi. M.K., Angawi. K., Alshareef. N., Qattan. A.M.N., Helmy. H.Z., Abudawood.Y., *et al*. (2020) Knowledge, Attitude and Practice Toward COVID-19 Among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study. Front Public Health. 8:217.
- Al-Mohrej. O.A.,Al-Shirian. S.D., Al-Otaibi. S.K., Tamim.H.M., Masuadi. E.M., Fakhoury. H.M. (2016) Is the Saudi public aware of Middle East respiratory syndrome? J Infect Public Health. Jun;9 (3) : 259.
- Cavanaugh, A.M., Spicer, K.B., Thoroughman, D., Glick, C, Winter K. (2021) Reduced Risk of Reinfection with SARS-CoV-2 After COVID-19 Vaccination - Kentucky. Morb Mortal Wkly Rep. Aug 13; 70 (32) : 1081–3.
- Daly. M., Robinson. E. Willingness to Vaccinate Against COVID-19 in the U.S.: Representative Longitudinal Evidence From April to October 2020. (2021) Am J Prev Med. Jun ; 60 (6) :766–73.
- Dror. A.A., Eisenbach.N., Taiber. S., Morozov. N.G., Mizrachi. M., Zigron. A., *et al*.(2020) Vaccine hesitancy: the next challenge in the fight against COVID-19. Eur J Epidemiol. Aug;35 (8):775–9.
- K.G.M. Danabal., S.S. Magesh., S. Saravanan., V. Gopichandran. (2021) Attitude towards COVID 19 vaccines and vaccine hesitancy in urban and rural communities in Tamil Nadu, India - a community based survey. BMC Health Serv Res 8; 21(1).
- Kreps. S., Prasad. S., Brownstein. J.S., Hswen. Y., Garibaldi. B.T., Zhang. B., *et al*.(2020) Factors Associated With US Adults' Likelihood of Accepting COVID-19 Vaccination. JAMA Netw Open. Oct 20;3(10):e2025594.
- Kwok. K.O., Lai. F., Wei. W.I., Wong. S.Y.S., Tang. J.W.T. (2020) Herd immunity - estimating the level required to halt the COVID-19 epidemics in affected countries. J Infect. Jun ; 80(6):e32–3.
- Machingaidze. S., Wiysonge, C.S. (2021) Understanding COVID-19 vaccine hesitancy. Nat Med. Aug ; 27(8):1338–9.
- Mannan, Kazi Abdul and Farhana, Khandaker Mursheda, Knowledge, Attitude and Acceptance of a COVID-19 Vaccine: A Global Cross-Sectional Study (December 7, 2020). International Research Journal of Business and Social Science, vol.6, no.4, 2020, Retrieved from: http://dx.doi.org/10.2139/ssrn.3763373

- Mohamed. N.A., Solehan. H.M., Mohd Rani. M.D., Ithnin. M., Che. Isahak. C.I.(2021) Knowledge, acceptance and perception on COVID-19 vaccine among Malaysians: A web-based survey. PloS One. 16 (8) : e0256110.
- MacDonald.N.E., SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy: Definition, scope and determinants. (2015) Vaccine. Aug 14 ; 33 (34) : 4161–4.
- Neumann-Bohme. S., Varghese. N.E., Sabat. I., Barros. P.P., Brouwer. W., van Exel. J. *et al*. (2020) Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. Eur J Health Econ Prev Care. Sep;21 (7) : 977–82.
- Stamatatos, L., Czartoski, J., Wan, Y-H., Homad, L.J., Rubin, V., Glantz, H., *et al*. (2021) mRNA vaccination boosts cross-variant neutralizing antibodies elicited by SARS-CoV-2 infection. Science. Mar 25; eabg 9175.
- Wong. M.C.S., Wong. E.L.Y., Huang. J., Cheung. A.W.L., Law. K., Chong. M.K.C., *et al*. (2021) Acceptance of the COVID-19 vaccine based on the health belief model: A population-based survey in Hong Kong. Vaccine. Feb 12;39(7):1148–56.

Table 1: Participants socio-demographic characteristic

Characteristic (N=170)	**N (%)**
Mean age (SD)	45.26 (18.73%)
Gender	
Male	96 (56.21%)
Female	74 (43.79%)
Occupation	
Landowner	31 (18.34%)
Farm worker	43 (25.44%)
Labourer	15 (8.6%)
Student	17 (9.7%)
House help	12 (6.8%)
Housewife	43 (25.44%)
Business owners	10 (5.7%)
Unemployed	2 (1.17%)
Educational qualification	
Below 10th class	98 (57.64)
10th pass	36 (22.5%)
12th pass	24 (14.11%
Graduate	3 (1.88%)
Chief source of information	
Television	118 (72%)
Newspaer	37 (22.6%)
Friends, coworkers, neighbours, relatives	112 (68.3%)
Social media	45 (27.4%)
Radio	3 (1.8%)
Doctors/ health care professionals	3 (1.8%)
Most trusted source of information	
Television	70 (43.5%)
Friend, coworker, neighbour, relative	29 (18%)

Doctor/ healthcare professional	50 (31.1%)
Newspaper	10 (6.2%)
Social media	3 (1.9%)
Don't trust any source	8 (4.8%)

Table 2: Descriptive summary of COVID-19 vaccination knowledge

Knowledge Questions (N=158)	**Yes**	**No**	**Unsure**	**Other response**
Side effects of theCOVID vaccine?				
Fever Fatigue	1	-	-	
Headache	3	-	-	
Muscle pain	9	-	-	
Chills	5	-	-	
Pain at injection site	9	-	-	
Vomiting	3	-	-	
Nausea	8	-	-	
Allergic reaction	6	-	-	
COVID-19 infection	4	-	-	
No side effects	9	-	-	
Paralysis	7	-	-	
Death	5	-	-	
Don't know	6	-	-	
Vaccination if you are COVID-19 positive?	23	27	108	
Suffer fromside effects?	8	114	13	Yes, but the severity varies –23
Immune immediately after gettingfirst dose of vaccination	26	65	67	

After treatment still is vaccination required	116	6	36	
Should children (aged below 18 years) get vaccinated	8	92	58	
Following otherprecautions (eg. Wearing mask, social distancing) after getting vaccinated?	143	2	13	
Vaccine work against new mutant strainsof virus?	38	5	98	There is not enough information yet-17
Necessary to take the second dose after first dose	107	5	32	It is a good measure but one dose also provides sufficient immunity- 13
Pregnant/lactating women get vaccinated	7	33	102	On consultation with doctor-16
Vaccination if you are suffering from any chronic diseases and taking medication	51	39	38	On consultation with doctors- 30

Knowledge question (N=154)					

Phase 3 vaccination policy, eligible for receiving COVID-19 vaccine?	126	16	4	12	-
Doses of vaccine are required, and at what intervals?	2 doses at a gap of 4-12 weeks 85	2 doses, not aware of time interval 5	3 doses 9	1 dose 6	Unsure 48

Table 3: Descriptive summary of attitude toward COVID-19 vaccination

Statement (N=158)	**Completely agree**	**Somewhat agree**	**Unsure**	**Somewhat disagree**	**Completely disagree**
I am willing to get vaccinated for COVID-19 Avg=3.26	**29**	**49**	**32**	**30**	**18**
Vaccination is essential to combat the COVID-19 pandemic Avg= 3.74	**34**	**74**	**30**	**16**	**4**
vaccines are completely safe for humans Avg- 3.27± 0.728	**9**	**63**	**51**	**32**	**3**

vaccines are very effective in providing protection Avg= 3.15± 0.848	**3**	**65**	**52**	**29**	**9**

Figure 1: Scatter chart showing relationship between knowledge and attitude toward COVID-19 vaccination

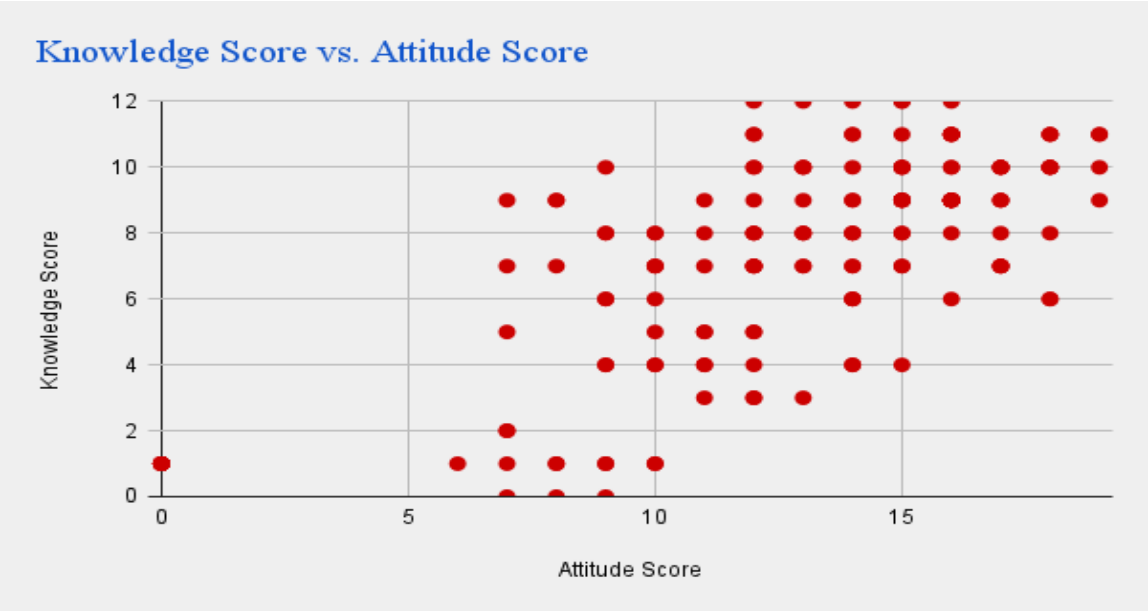


Table 4: Assessment of Knowledge and attitude scores across socio-demographic characteristics

Characteristic (N=158)	**Knowledge score (max. 13)** (Avg. ± SD)	**Attitude score (max. 20)** (Avg +_ SD)
Gender		
Male	7.336 ± 2.41	12.789 ± 3.17
Female	6.797 ± 3.49 (p value= 0.25)	12.040 ± 3.25 (p value= 0.15)
Educational qualification		
Below 10th	6.20 ± 3.15	11.18 ± 3.42
10th pass	8.84 ± 2.1	14.52 ± 2.78
12th pass	8.32 ± 2.56.	14.32 ± 2.37
Graduate	10.66 ± 0.58	14.66 ± 3.05
Occupation		
Land owner	8.58 ± 2.14	14.13 ± 3.39
Farm worker	5.19 ± 3.38	11.07 ± 3.32
Labourer	7.92 ± 2.17	13.07 ± 3.91
House help	4.73 ± 3.39	11.64 ± 3.77
Student	8.47 ± 2.42	14.12± 2.64
Housewife	7.67 ± 1.93	12.16 ± 2.72

Figure 2: Age distribution of vaccine-hesitant participants

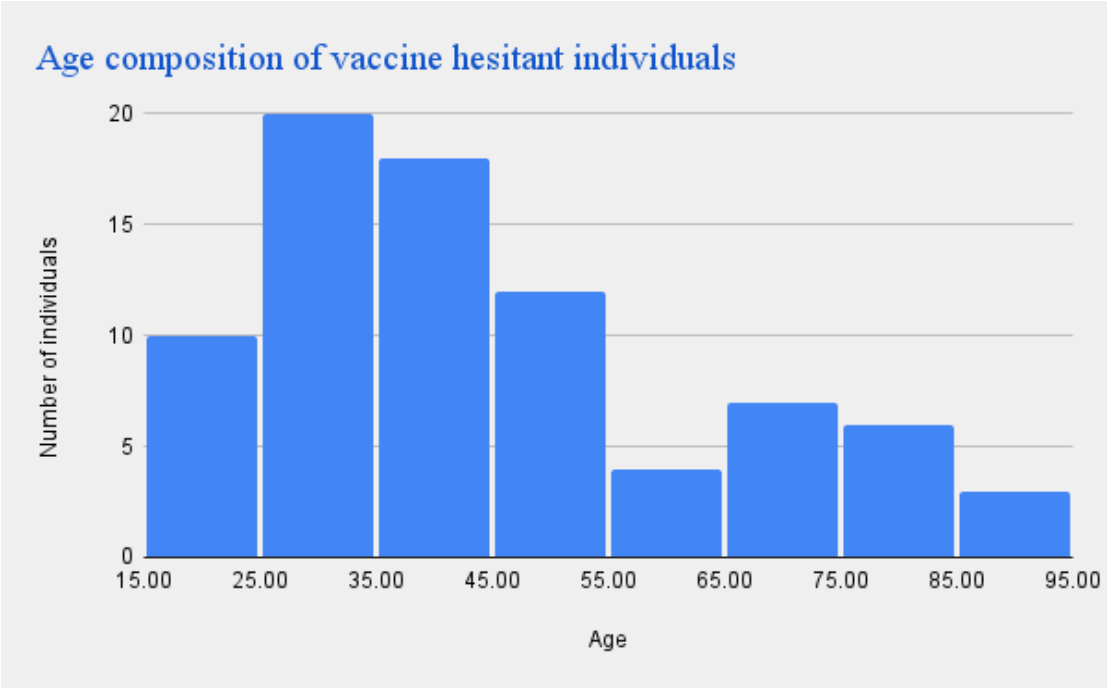
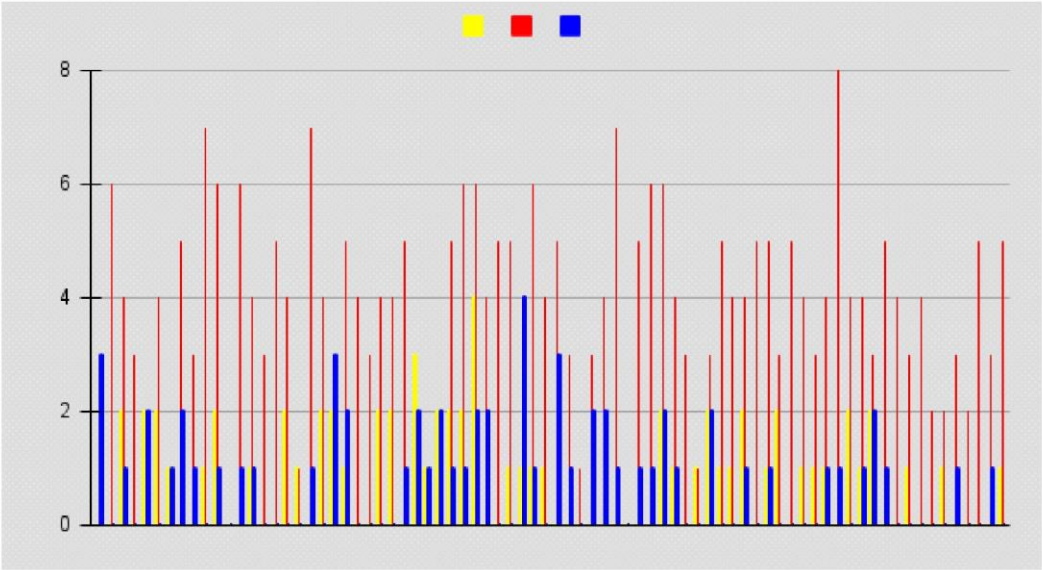


Figure 3 : Determinant scores of vaccine-hesitant individuals



RED – Individual and group influences, YELLOW- Vaccine specific, BLUE- Contextual influences