Linking Perceived Efficacy of Covid-19 vaccine, Risk Perception and Health Safe Behaviour in the Post-Covid-19 Era

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Abstract

Covid-19 came with an unpredictable surge with severe effects on human-beings across the globe, causing both physical, social, economic, and psychological damage. Although safety protocols and restrictions on Covid-19 have been lifted, safety behaviour may be sustained. Using a cross-sectional design, this study examined the effect of perceived efficacy of Covid-19 vaccine, perceived risk likelihood and severity of Covid-19 on health safe behaviour and the mediating role of perceived risk severity and probability on the link between perceived efficacy of Covid-19 vaccine and health safety behaviour in the current post Covid-19 Era. Three hundred and ten teaching and non-teaching university staff members (152 males and 158 females with a mean age of 32.39) randomly sampled from 2 states in the south-east Nigeria, responded to scales measuring perceived efficacy of covid-19 vaccine, perceived risk probability and severity of Covid-19 and health safe behaviour. **T**he results of the study show that higher perception of the efficacy of Covid-19 Vaccine encouraged health safe behaviour. Also Covid-19 perceived risk probability and severity were positively related to health safety behaviour. Implications of the study were discussed accordingly and basically, it was established that improved awareness on the probability and severity of contracting a disease can help improve safety behavior.

***Keywords*:** Covid-19 vaccine, perceived efficacy, risk perception, health safe behaviour

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Introduction

Human perception is a cognitive factor that plays a major role in driving human behaviour (Kouabenan et al., 2015; Paek & Hove, 2017). Following the trend of Covid-19, there were several perceptions that trailed its existence, from its susceptibility, to its controllability, it's severity, and to perceptions surrounding the vaccination as a tool for curtailing Covid-19 existence. Covid-19 virus as a pandemic, brought about a huge variation in human perception which may have in one way or the other, defined behaviour towards curtailing the disease and upholding health safe behaviour even in post-Covid-19-era. The unforeseen and unplanned nature of the pandemic initiates danger to physical, social, economic, and psychological domains of life. Looking at the background, Corona-virus disease (Covid-19) is a recent trend of health emergency that affected the world, which has its root from a laboratory in Wuhan, China in 2019, and deeply affected the lives of individuals across the world (Woolfe et al., 2021). By nature, Corona-virus disease is a respiratory infectious disease resulting from a virus called severe acute respiratory syndrome Corona-virus 2 (SARS-CoV-2) (World Health Organization, 2022). It is highly contagious and a cause of mortality to millions of lives globally. Mathieu et al. (2023) reported that between 2020 to 2021, about 14.9 million deaths were associated with Covid-19, and as of May 29, 2023, about 6.9 million people lost their lives due to the pandemic (World Health Organization, 2023). Looking at the rapid spread of the virus and subsequent mortality rate, safety behaviours were initiated by health institutions and government agencies to curtail its spread (Fadda et al., 2022). These safety behaviour span through hand washing, physical and social distancing, wearing of masks in public places, and personal hygiene (Center for Disease Control, 2020). However, February 11, 2020 drew attention on researches on the development of Covid-19 vaccine as an immunity against the virus after the discovery of Covid-19 genetic sequence (Whitworth, 2020). After the successful development of different vaccines and their trials, which showed their efficacies in preventing the spread of Covid-19, vaccine intake was included among the safety behaviours against Covid-19 (Patterson et al., 2022). Wu et al. (2020) highlighted the importance of the vaccination and other protective behaviours towards limiting the spread of the pandemic.

The emphasis on adopting Covid-19 safety behaviours became paramount in developing countries, like Nigeria, with initial prediction proposing adverse outcome of Covid-19 for low to middle-income countries (Berhan, 2020). Challenging and dilapidated health systems were among the factors that influenced the prediction (Berhan, 2020). However, in reality, the trajectory was low, and such countries, like Nigeria grew above the projection, in line with low prevalence and mortality rate (Ochu et al., 2021). Such outcome may influence the adoption of Covid-19 safety behaviours, with Nigerians having been found wanting in adopting safety measures to an illness (Nnama-Okechukwu et al., 2020). A good explanation to this is the perceived perception of risk and perceived efficacy of treatment mechanism. Nevertheless, risk perception is an important element in health systems, as it influences people's reactions and actions towards health conditions (Paek & Hove, 2017). Risk perception here entails the subjective assessment of perceived negative occurrences that may come with an illness, injury, disease or death (Paek & Hove, 2017). On the other hand, perceived efficacy of treatment mechanism assumes an individual's confidence in the ability of such treatment approach, such as medication, to curtail the spread, or manage a disease or illness, is largely influenced by past experiences of a prevailing culture. Influencing this phenomenon is the projection of such treatment approach in the media, which influences how people perceive the approach and their confidence on the approach in bringing about positive outcome and thus, may influence the adoption of safety behaviours associated with the disease or illness. These

factors that may influence the adoption of safety behaviours are rooted in the health belief model (Rosenstock,1974). The health belief model explains how attitudes and perception of illness risks largely influence actions or inactions towards adoption of safety behaviour associated with mitigating the spread of the illness or disease (Glanz, 2005). Health belief model which includes perceived efficacy, perceived susceptibility, perceived severity, perceived benefits and perceived barriers have been used to explain health and safety behaviours. However, for the present study, perceived efficacy of Covid-19 vaccine, perceived risk susceptibility to Covid-19 and perceived risk severity to Covid-19 will be explored on how they influence the adoption of Covid-19 safety behaviours. With no previous study exploring the moderating role of perceived risk severity of Covid-19 on the link between perceived efficacy of Covid-19 vaccine on Covid-19 safety behaviours, the present research aims to leverage from the gap in literature.

Perceived covid-19 vaccine efficacy and health safe behaviours

Ideally, health belief system helps in treatment outcome. Specifically, the belief in the ability of a treatment approach to help mitigate against the spread of an illness or treat an illness is a factor that can influence the acceptance and association of the safety behaviours associated with the illness or disease. Generally, Covid-19 vaccine helps in the reduction of the severity of the disease, as well as being more susceptible to hospital admission (Andrews et al., 2022). Such is however dependent on the acceptance of the vaccine in line with its perceived efficacy in controlling the spread of the disease. Thus, perception of the efficacy of a treatment, can influence presentation to vaccination and adoption of other safety behaviours. Ideally, the acceptance of a vaccine rests on its side effects, information presented about the vaccine, perceived effectiveness of the vaccine, and perceived susceptibility and severity to the illness after taking the vaccine. Sadique et al. (2023) proposed that for people to accept vaccine, they weigh the perceive benefit of the vaccine, as well as perceived susceptibility and severity of and to the illness. Such acceptance resulting from perceived efficacy of the vaccine may not only influence subjecting to being vaccinated; also, may influence adoption of other safety behaviours associated with the illness or disease. Loomba et al. (2021) reported that people were rather reluctant to getting Covid-19 vaccine, with preference on the immunity gained from contracting the illness, as spread by false narrative, which fuelled non-adoption of safety behaviours. Also, Ahamed et al. (2021) highlighted that despite known perception on the importance of Covid-19 vaccine, people were reluctant to take them, due to the misconceptions and speculations associated with the vaccine and virus. More so, people rejected the Covid-19 vaccine due to their concerns for its side effects, lack of trust about general vaccine, and over confidence in their health condition (Caserotti et al., 2021). These highlights lack of trust in the efficacy of Covid-19 vaccine, which may influence the adoption and engagement of safety behaviours.

Furthermore, Beg et al. (2022) reported that despite greater recommendations by people to be vaccinated, less than 50% of the respondents were confident on the efficacy of Covid-19 vaccine. In another finding, Marzo et al. (2022) showed that about 64% of the respondents agreed to the efficacy of Covid-19 vaccine to control the spread of Covid-19; however, the study failed to accommodate its linkage with the adoption and engagement in Covid-19 safety behaviours. With the distrust in engaging in safety behaviours in the Nigerian population (Nnama-Okechukwu et al., 2020), and the low prevalence and deaths associated with Covid-19 in Nigeria, one may ponder the belief on the efficacy of the vaccine among Nigerian population. To the best of the researcher's knowledge, no study had linked the perceived efficacy of Covid-19 vaccine on health safe behaviours; hence the present study.

H1: Perceived efficacy of Covid-19 vaccine will significantly predict health safe behaviours.

Perceived risk susceptibility of covid-19 and health safe behaviours

Assessment of risk is an important element in behaviours (Sadique et al., 2013). One of the risk assessed is how well an individual is likely to contract the illness or disease, which explains perceived susceptibility. This may influence how well an individual engages in safety behaviours associated in preventing the spread of the illness or disease. Moreover, perceived risk susceptibility refers to the perception of an individual's tendency to contract a health condition (De Donno et al., 2022). This may largely be influenced by perception of healthy immune system, the illness, and misconceptions associated with the illness. In essence, high perceived susceptibility may lower individuals' passivity on the adoption of safety behaviours. However, when the perceived susceptibility is low, there may be lack of motivation to engage in safety behaviours associated with the illness or disease. According to Ochu et al. (2022), people that do not believe in being at risk of contracting Covid-19 failed to comply with safety behaviours. In another study, Hornik et al. (2021) reported that people engaged in protective behaviours, such as wearing of face mask, distancing self in social settings, when they perceived greater susceptibility to contracting Covid-19. Also, An et al. (2023) showed that an increase in the adoption of protective behaviours was associated with greater susceptibility to Covid-19. Moreover, study by Brewer et al. (2012) show that a higher perception of the susceptibility and perceived severity of getting an illness, is associated with health safe behaviour of getting vaccinated. In the same view, Kouabenan and Safiétou (2015) found that first line managers with high perception of work risks surrounding relating to employees, are more disposed to engage in safety actions.

However, while these findings showed good association, Ilasenmi and Afolabi (2020) using the Nigerian population showed a weak relationship between perception of risk of contracting Covid-19 and adoption of Covid-19 safety behaviours. In another interesting, but contrasting study, Kim and Kim (2020) showed a negative relationship between perceived susceptibility to Covid-19 and adoption of Covid-19 safety behaviours among China population. In essence, the higher the level of susceptibility, the lower the level of engagement in Covid-19 safety behaviours. Also, Tadesse et al. (2020) found that perceived susceptibility to Covid-19 did not predict Covid-19 safety behaviours in Ethiopian population. In similar finding, Shohnani et al. (2020) showed no association between perceived susceptibility to Covid-19 and Covid-19 safety behaviours. Additionally, Tong et al. (2020) showed that perceived susceptibility to COVID-19 did not influence engagement in Covid-19 safety behaviours. These varying findings showed inconsistencies in line with perceived susceptibility to Covid-19 and adoption of Covid-19 safety behaviours. Such inconsistency observed in both developed and developing countries calls attention for more research to be conducted to gain clarity on the link between perceived susceptibility and safety behaviour. Observed inconsistency here may be linked to cultural differences in the perception of risk, and how safety practice was assessed and methodological issues. Highlighting this, Chukuorji and Iorfa (2020) opined that Nigerians perceived Covid-19 to be associated with the political class and high socio-economic class, as well as a disease for the noble (Nwaubani, 2020). This may impair the ability of Nigerians to engage in established safety behaviours. However, with the reorientation on Covid-19 over the years, such perception might have changed. This may only be determined through scientific studies, like the present study. While most studies linking perceived susceptibility to Covid-19 and safety behaviours assessed the link through correlation studies in line with the health belief model (An et al., 2023; Hornik et al., 2021;

Ilasenmi & Afolabi, 2020), the predicting study (e.g. Tadesse et al., 2020) linking perceived susceptibility to Covid-19 on safety behaviours was not significant and scarce. With the power of regression in controlling demographic and extraneous variables, predicting study will be of importance in unravelling the inconsistency in the linkage between perceived susceptibility to Covid-19 and safety behaviours. Despite assumptions that Nigerian population are not susceptible to engage in safety behaviours (Nnama-Okechukwu et al., 2020), fear of contracting the illness may serve as a factor predicting engagement in safety behaviours; thus, the following hypothesis was tested:

> ***H2:*** Perceived risk probability of Covid-19 will significantly predict health safe behaviours.

Perceived risk severity of Covid-19 and health safe behaviours

Perceived risk severity is associated with the evaluation of how serious contracting a disease or illness will be on the individual, as well as the consequences that may follow contracting the disease or illness (De Donno et al., 2022). Perceived risk severity in contracting an illness or disease influences the adoption of preventive practices (De Donno et al., 2022). Fear is assumed when a health condition is perceived as life threatening. In situations like this, individuals are motivated to engaging in safety behaviour protocols that will prevent them from contracting the illness. From the research literature Kim and Kim (2020) showed that perceived risk severity of Covid-19 positively influence the combined use of preventive practices. In similar finding, Tong et al. (2020) found that perceived risk severity of Covid-19 was associated with preventive practices. Relatedly, Magnan et al. (2021) showed that perceived severity of Covid-19 was associated with social distancing. Notwithstanding this, some researchers (e.g. Alagili & Bamashmous, 2021; Shahnazi et al., 2020; Shewasinal Yehualashet et al., 2021) showed no association between perceived risk severity of Covid-19 and practising safety behaviours. However, in the Nigerian population, lack of research was found on the link between perceived risk severity of Covid-19 on safety behaviours. Related study was that of Isere et al. (2022), and Onubi et al. (2021), as they all found that high risk perception of Covid-19 influenced the practice of safety behaviour. From the foregoing, it is imperative to investigate on the link between perceived risk severity of Covid-19 on safety behaviours, looking at the dilapidated health systems, which may leave cases of Covid-19 in severe risk; hence, the adoption of safety practices among the citizens.

In addition, despite the effectiveness of Covid-19 vaccine in limiting the symptoms and spread of Covid-19 (Latkin et al., 2021), Almansour et al. (2022) highlighted that people failed to engage in Covid-19 preventive practices, such as vaccination, due to lack of trust in the efficacy of the vaccine. However, perceived risk probability or severity of Covid-19 may moderate the link between perceived efficacy of Covid-19 vaccine and adoption of protective practices (Isere et al., 2022; Onubi et al., 2021). With perceived risk severity embedded in risk perception (Shahnani et al., 2020), perceived risk severity of Covid-19 may influence the belief in the efficacy of Covid-19 vaccine. When this is in place, there may be likelihood in adoption and practices of safety behaviour. In line with this the following hypotheses were tested:

> ***H3:*** Perceived risk severity of Covid-19 will significantly predict health safety behaviours
>
> **H4:** perceived risk probability (***H4a***) and perceived risk severity (***H4b***) of Covid-19 will moderate the link between perceived efficacy of Covid-19 vaccine and health safe behaviour.

The conceptual model of the study hypotheses can be seen in figure 1 below

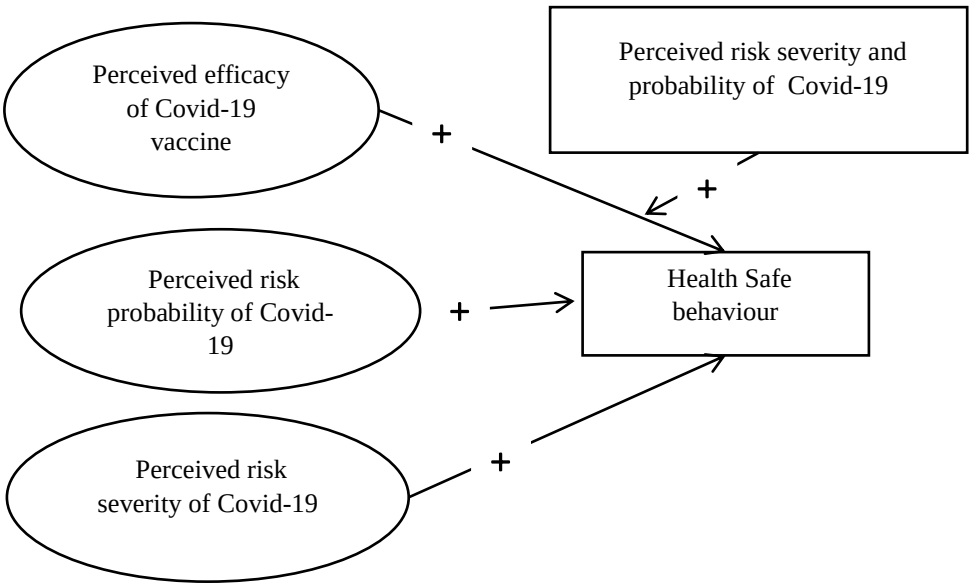

Figure 1: Conceptual model of the study hypotheses

Figure 1 shows an overview of the hypotheses of study mentioned above. Precisely, the model shows that both perceived efficacy of Covid-19, perceived risk probability of Covid-19 and perceived risk severity of Covid-19 will significantly relate with health safe behaviour. Moreover, the model indicates that perceived risk probability and severity will moderate the link between perceived efficacy of Covid-19 vaccine and Health safe behaviour.

Method

Sample and sampling procedure

A total of three hundred and ten (310) teaching and non-teaching staff members across universities in South-East Nigeria participated in the study. These participants were randomly selected and consented to participate in the study through filling the study consent form. The participants were made-up of 158 females and 152 males with age ranged from 25 to 42 (M = 32.39, SD = 0.97). Initially, 342 questionnaires were administered to the participants in their various institutions. However, only 93.86% (321) return rate was recorded. Out of the 321 responses returned, 11 were not included for the final analysis, as they were not properly filled. Thus, 310 copies of the returned questionnaires were included for the final analysis.

Instruments

Study scale development and measures

Four scales were developed for the study which are the scale measuring perceived effectiveness of Covid-19 vaccine, Covid-19 perceived risk probability scale, Covid-19 perceived risk severity scale and health safe behaviour scale. The last section of the questionnaire is made up of questions to obtain the participants demographics such as age, gender, education, vaccine status e.t.c. 5-point Likert format was used to rate the item responses. The items of the scales were developed based on information obtained from the web

from relevant authorities like WHO (2023) and based on the knowledge from existing literature (Nasir, et al., 2021). Discussions with medical personnel were carried out for a face validity, while a Cronbach's alpha were applied for scale validation.

Perceived effectiveness of Covid-19 vaccine scale- is a 3-item scale, developed to obtain participants view about the effectiveness of Covid-19 vaccine. The items responses range from 1 = not at all effective to 5 = very much effective. Examples of the items are: *Covid-19 vaccine is safe, COVID-19 vaccine is effective in preventing Covid-19 etc.* The reliability value of the 3-item scale is ($\alpha = 0.83$).

Covid-19 perceived risk probability scale – this is a 2-item scale, designed to measure participants perceived probability of one contacting covid-19. The responses range from 1 = very low probability to 5 = very high probability. The items of the scale include, *I feel I can get infected with Covid-19, I feel afraid I will be infected with Covid-19.* A Cronbach's alpha shows a satisfactory reliability value ($\alpha = 0.70$).

Covid-19 perceived risk severity scale: This is a 5-item scale to measure how individuals perceive the seriousness of contacting Covid-19. The items responses range from 1 = not at all serious to 5 = very much serious. Examples of the items are: *Do you feel having any of the symptoms of Covid-19 will be very serious: Having fever or chills, cough, headache, etc. The scale* reliability value ($\alpha = 0.89$).

Safety behaviour scale- safety behaviour is measured with a 5-item scale that shows possible actions that can be followed to avoid contacting convid-19. The responses range from 1 = strongly disagree to 5 = strongly agree. Some of the items are *whenever I see myself in a crowd, I try to avoid close contact with people, Whenever I go to a high-risk area like hospital or laboratory, I put on my face mask; any time I feel like sneezing or coughing, I do it into my bent elbow e.t.c.* The items had an acceptable reliability coefficient ($\alpha = 0.83$).

Study design and statistics

This research study adopted a cross-sectional research design, using Pearson product-moment correlation analysis to determine the interrelationships among the studied variables. Additionally, multiple linear regression analysis was used to verify the direct and interaction effect among study variables using the Statistical Package for the Social Sciences software (SPSS) Version 25. The independent variables of the study were perceived efficacy of Covid-19 vaccine, perceived risk severity and perceived risk probability of Covid-19 while Health Safe Behaviour is the dependent variable.

Results

Inter-correlation analysis among study variables

Table 1: Inter-correlation analysis among study variables (n = 310)

Variable	M	SD	1	2	3	4	5	6
Perceived effectiveness of Covid-19 vaccine	4.36	0.76	-					
Covid-19 perceived risk probability	3.70	0.87	0.80**	-				
Covid-19 perceived risk severity	4.19	0.78	0.40**	0.46**	-			
Safety behaviour	2.56	0.95	0.18**	0.19**	0.14*	-		
Age	32.39	8.97	-0.04	-0.01	0.02	0.06	-	
Gender	-0.02	1.00	-0.01	-0.03	0.05	-0.03	0.14*	-

Note: ** = $p < 0.001$; * = $p < 0.05$

Table 1 shows the mean, standard deviation and inter-correlation among study variables. From the table, the result showed that perceived effectiveness of Covid-19 vaccine was positively related to safety behaviours ($r = 0.18$, $p<0.001$), Covid-19 perceived risk probability was positively related to health safety behaviour ($r = 0.19$, $p<0.001$), and Covid-19 perceived risk severity was positively related to health safety behaviour ($r = 0.14$, $p<0.05$). Also, the result showed that Covid-19 perceived risk probability was positively related to perceive effectiveness of Covid-19 vaccine ($r = 0.80$, $p<.001$), and Covid-19 perceived risk severity was positively related to perceive effectiveness of Covid-19 vaccine ($r = 0.40$, $p<0.001$). In addition, the result showed that Covid-19 perceived risk probability was positively related to Covid-19 perceived risk severity ($r = 0.46$, $p<0.001$), and gender was positively related to age ($r =0.14$, $p<0.05$).

Analysis of the hypotheses of the study

Table 2 is the regression output which shows the predictive values of the predictor variables on the outcome variable. From the table, the result showed independently that, perceived effectiveness of Covid-19 vaccine positively predicted Covid-19 safety behaviours ($b = 0.18$, $R^2 = 0.01$, t (310) = 3.21, 95 % *CI* [0.09, 0.36], $p =0.002$), Covid-19 perceived risk probability positively predicted health safety behaviours ($b = 0.14$, $R^2 = 0.01$, t (310) = 2 .45, 95 % *CI* [0.03, 0.27], $p =0.02$), and Covid-19 perceived risk severity positively predicted health safety behaviours ($b = .19$, $R^2 =0.01$, t (310) = 3.39, 95 % *CI* [0.10, 0.37], $p =0.001$).

Table 2.

Multiple linear regression analysis predicting the link between the IVs and Covid-19 safety behaviour

Variable	*B*	R^2	*T*	*P*	*95% CI*
Perceived effectiveness of Covid-19 vaccine (PECV)	0.18	0.01	3.21	0.002	[0.09, 0.36]
Covid-19 perceived risk probability (PRP)	0.14	0.01	2.45	0.02	[0.03, 0.27]
Covid-19 perceived risk severity (PRS)	0.19	0.01	3.39	0.001	[0.10, 0.37]

Dependent variable: health safe behaviour

Moderating effects of perceived risk probability on the link between perceived efficacy of vaccines and safety behaviours

Table 3, revealed that the interaction between perceived efficacy of Covid-19 vaccine and perceived risk probability on safety behaviours was significant. This means that perceived probability can moderate the effect of Perceived efficacy of Covid-19 vaccine on health safety behaviour. From the results, perceived efficacy of Covid-19 vaccine predicted safety behaviours ($B = 0.84$, $p = 0.004$). Also, perceived risk probability predicted safety behaviours ($B = 0.97$, $p = 0.011$). Again, perceived risk probability moderated the association between perceived efficacy of vaccine and safety behaviours ($B = -0.19$, $p = 0.019$). The slope showed that when the perceived efficacy of Covid-19 vaccine is high, perceived risk probability of Covid-19 tends to lessen and thus, lowers the adoption of health safe behaviours. In essence, the positive effect of perceived efficacy of Covid-19 vaccine on health safe behaviour tends to lessen when there is a low perception of the probability of Covid-19. This supports our hypothesis 4 that Perceived risk probability of Covid-19 can moderate the effect of Perceived efficacy of Covid-19 on health safe behaviour.

Table 3:

Moderating effects of perceived risk probability on the link between perceived efficacy of vaccines and safety behaviours

Variables	*B*	SE	*t*	*p*	95%CI
Perceived effectiveness of Covid-19 vaccine (PECV)	0.84**	0.29	2.89	0.004	[0.27, 1.41]
Covid-19 perceived risk probability (PRPC)	0.97**	0.38	2.57	0.011	[0.23, 1.71]
PECV x PRPC	-0.19*	0.08	-2.36	0.019	[-0.36, -0.03]

*Note: B = Regression coefficients; SE = Standard Error; t = population t value; p = Probability level; CI = Lower & Upper Confidence Interval. *p <0 .05; **p <0 .01.*

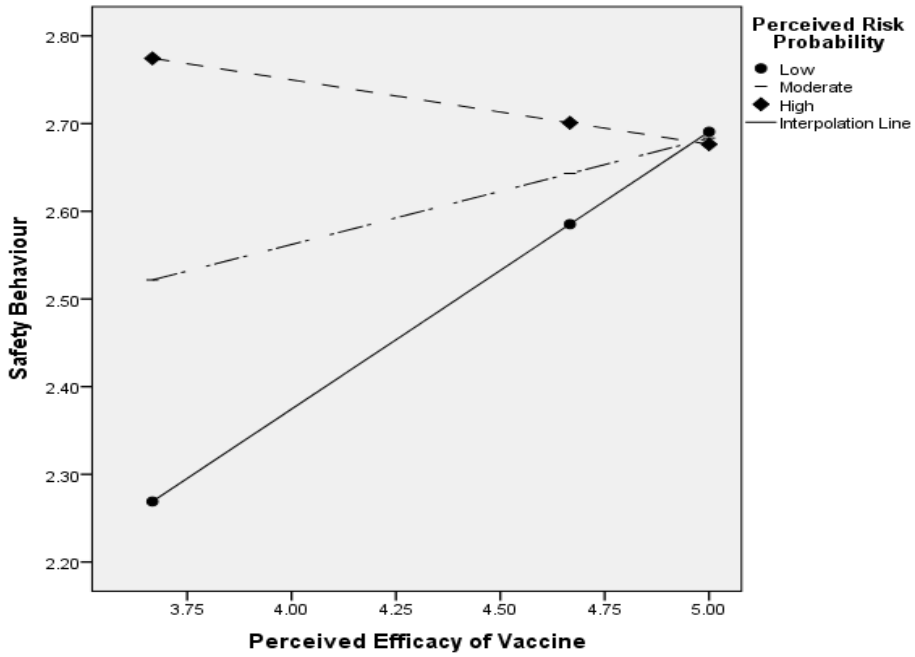

Figure 2: Interactions between perceived efficacy of COVID-19 vaccine and perceived risk probability on safety behaviours.

Moderating role of perceived risk severity on the link between perceived efficacy of vaccines and health safe behaviours

Table 4 showed that, the interaction between perceived efficacy of Covid-19 vaccine and perceived risk severity on safety behaviours is not significant. This entails that perceived severity of Covid-19 cannot moderate the effect of perceived efficacy of Covid-19 vaccine on safety behaviour. Hence, hypothesis 5 was not supported. Specifically, perceived efficacy of Covid-19 vaccine did not predict safety behaviours (B = -0.25, p = 0.453). Also, perceived risk severity did not predict Covid-19 safety behaviour (B = -0.20, p = 0.597). Again, perceived risk severity did not moderate the association between perceived efficacy of vaccine and safety behaviours (B = 0.09, p = 0.301).

Table 4: Moderating role of perceived risk severity on the link between perceived Efficacy of vaccines and safety behaviours

Variables	*B*	SE	*t*	*p*	95%CI
Perceived effectiveness of Covid-19 vaccine (PECV)	-0.25	0.34	-0.75	0.453	[-0.91, 0.41]
Covid-19 perceived risk severity (PRSC)	-0.20	0.39	-0.53	0.597	[-0.96, 0.55]
PECV x PRSC	0.09	0.09	1.04	0.301	[-0.08, 0.26]

*Note: B = Regression coefficients; SE = Standard Error; t = population t value; p = Probability level; CI = Lower & Upper Confidence Interval. *p < .05.*

Discussion

In line with the health belief model, the study results showed that perceived efficacy of Covid-19 vaccine positively predicted safety behaviours. In essence, when people perceive that the vaccine they are being given are efficient in curtailing the spread of the virus, they will be motivated to accept the vaccine and adopt other safety behaviours, in order to prevent them from contracting the illness or disease. The premise of this is that the positive belief in a disposition such as disease vaccine breeds confidence on the outcome; as such, vaccine acceptance is likely, which will foster further adoption of other safety behaviours. This finding is consistent with hypothesis 1, and the novel nature of this finding adds positively to the literature of Covid-19. However, despite no previous research on this area, the finding was related to the findings of Marzo et al. (2022), as they reported that people believed in the efficacy of Covid-19 vaccine as a means to control the spread of the virus.

Similarly, consistent with hypothesis 2, the study showed that perceived Covid-19 risk probability predicted safety behaviour. Buttressing this, when one holds a belief on being susceptible to an illness or disease, there is higher chances of adopting safety behaviours to prevent contracting such disease. The perception of probability to contract Covid-19 may be due to age, genetic characteristics, health complications and environment. Such situations will bring about assessment on how susceptible they are to contracting the illness; hence, adopting safety behaviours to prevent that from happening. Consistent with this finding is the findings of De Donno et al. (2022) as they showed a positive association between perceived susceptibility to Covid-19 and adoption of preventive practices. Also, Yehulash et al. (2021) showed an association between perceived susceptibility and protective behaviours. In addition, Ilasenmi and Afolabi (2020) reported that the likelihood to contract Covid-19 was associated with the adoption of preventive practices.

Furthermore, consistent with hypothesis 3, the study showed that perceived Covid-19 risk severity positively predicted safety behaviours. Belief in the serious consequences of contracting an illness or disease will trigger the adoption of safety behaviours towards preventing such from happening. Such may be linked with the seemingly fragile health system evident in developing nations like Nigeria (Berhan, 2020); thus, there is a belief that the consequences of contracting the illness or disease will be disastrous. Such belief will then foster the adoption of safety practices to prevent contracting the illness or disease, due to projection of fear. In addition to this, the consistent information of death tolls recorded due to the disease may have triggered the perceived risk severity. The premise here may be the perception that since higher death tolls is recorded in a more developed health system, such illness may be more severe in a fragile health system of the developing countries like Nigeria. This finding is however consistent with the findings of authors (e.g. Kim & Kim, 2020; Magnan et al., 2021; Tong et al., 2020), who all showed that perceived Covid-19 risk severity influenced the adoption of safety practices.

More so, consistent with hypothesis 4a, the study showed that perceived risk probability of Covid-19, moderated the link between perceived efficacy of Covid-19 vaccine and safety behaviours. In essence, when the perceived efficacy of Covid-19 vaccine is higher, perceived risk probability of Covid-19 lessens and as such, lowers the adoption of safety behaviours. This may be as a result that people who have high trust in the efficacy of Covid-19, tend to believe that their susceptibility of contracting Covid-19 is low and therefore, do not need to abide by Covid-19 safety protocols. Although some studies like Ilasenmi and Afolabi (2020) and Kim and Kim (2020) found a negative link between perceived susceptibility to Covid-19 and adoption of safety behaviours, this present study may explain that. Hence a higher perception

in the efficacy of Covid-19 may reduce perceived probability of it's occurrence and in turn, reduces adoption of safety behaviour. Owing to hypothesis 4b, the outcome showed that perceived severity of Covid-19 did not influence the link between perceived efficacy of Covid-19 Vaccine on safety behaviour. Although authors like Sadique et al. (2013) opined that in order to accept vaccine and its efficacy, there is bound to be higher perceived risk and severity of the disease. Nevertheless, we found the contrary, which shows that individuals acceptance of the efficacy of Covid-19 and their adoption of safety behaviour may be dependent on some other factors. This an opening for further studies on this subject matter.

Implications of the Study

The findings from this study have implications. One of the implication rests on the importance of not only developing the vaccine and testing its efficacy, health organizations and agencies should prioritize great awareness of the efficacy of vaccines when needed, and the need for vaccine acceptance, which will foster positive perception of vaccine. In line with this, the populace through such awareness will accept the vaccine notwithstanding the projected negative outcome in the media. Moreover, they will be motivated to take the vaccine and adopt other safety protocols. This is important due to the economic cost of Covid-19 spread to the government in terms of the management and prevention. Hence, it will be beneficial to the government, as well as reducing the mortality rate of its spread. Also, the findings from the study positively added to the literature of Covid-19, as no previous study had established the link between perceived efficacy of Covid-19 vaccine and Covid-19 safety behaviours.

Additionally, with the recent findings of the moderating role of perceived risk probability of Covid-19 on the link between perceived efficacy of Covid-19 vaccine and Covid-19 safety behaviours. It will be of importance to improve awareness on the consequences of neglecting safety rules since perceived probability can lower safety behaviour with the presence of high perceived efficacy of Covid-19 vaccine. Moreover, owing to perceived severity and safety behaviour, there is need to improving on the health system, as the fear on the severity of the illness may not be on the death toll, looking at the low death toll recorded in the country. Such perceived risk severity may be due to the perception of fragile health system, and how disastrous it might be if the illness is contracted. In essence, it is cheaper to invest on the health system of the country, which will help create a good perception of an illness, and not based on the fear of the health system. Also, the findings will also influence policy makers on the importance of making the vaccine acceptance and efficacy of the vaccine in dealing with the virus, through making awareness on the risk of getting the virus, which has negative consequences.

Limitations of the Study and suggestion for further study

Notwithstanding the positive findings from this study, it is limited in some areas. The adoption of cross-sectional design for this study may have been beneficial; however, it may not capture causal relationship between variables. Other factors may contribute to the response of the participants at that point in time; hence, the study outcome may be affected. In essence, longitudinal study should be considered in subsequent research to help determine cause and effect relationship. Also, the use of teaching and non-teaching staff may have influenced the outcome of the study, looking at their knowledge on the effect of the virus on humans. With the perception of Nigerians on Covid-19 being a disease for the rich, it is advocated for subsequent research that random individuals from the society should be used for the research, to gain clarity on the study outcome. Also, there is a tendency to fake good in social desirability through a one-time response, and there is no means to validate the responses of the participants.

In essence, the one method of data collection may not be enough to get objective responses from the participants. Subsequent research should consider multiple sources of data collection in order to control this.

Conclusion

The present study investigated the relation between perceived efficacy of Covid-19 vaccine, perceived risk probability of Covid-19, and perceived risk severity of Covid-19 on safety behaviours, as well as the moderating effect of perceived risk severity on the link between perceived efficacy of Covid-19 vaccine on safety behaviours. The findings from the study affirmed the study hypotheses. With the new study findings, more replicative research should be done to fully establish this course, in order to influence policy decision in that regards.

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