Perceived risk and protective behaviors related to COVID-19 among the Nigerian general population: An application of the extended parallel process model

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ABSTRACT

Since the outbreak of the coronavirus disease 2019 (COVID-19), there have been heightened levels of fear worldwide. The steadily increasing number of COVID-19 cases in Nigeria as reported by the Nigerian center for Disease Control has led to different behavioral responses influenced by perceived threat and efficacy. This study aimed to understand the levels of perceived threat and efficacy to COVID-19 in Nigeria across various demographic groups using the Extended Parallel Process Model. This was a cross-sectional study conducted across all states in Nigeria, between May and June 2020. The majority of respondents were recruited via social media, with a smaller fraction interviewed face to face due to Government restrictions on movement in some states. Based on findings, respondents had high exposure to COVID-19 messages on social media (85%), followed by television (67%), radio (54%), and the Nigeria center for Disease Control short message services (52%). High exposure to COVID-19 messages across all media platforms was significantly associated with perceived severity, response efficacy, and self-efficacy ($p < 0.01$). Also, with an increase in age, there was a corresponding increase in the perceived susceptibility to COVID-19. As the level of education increased, respondents' perceived severity, susceptibility, self-efficacy, and response efficacy to COVID-19 increased. A chi-square test between demographic variables and intermediate outcome variables (danger or fear control process) showed a significant association with age, gender, highest educational level, and employment type. From the findings, the majority of respondents were less likely to practice the recommended protective behaviors as COVID-19 was not perceived as a threat. The proportion of the Nigerian population willing to take up recommended preventive behaviors were just 15%. Developing messages with an appropriate balance between threat and efficacy to target different audiences would likely encourage the adoption and practice of recommended COVID-19 preventive behaviors.

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Introduction

In December 2019, Wuhan, Hubei province of China recorded an outbreak of pneumonia cases of unknown cause. These pneumonia cases were subsequently identified as the novel coronavirus disease (COVID-19) [1,12]; which later spread globally. According to the World Health Organization (WHO), over twenty-six million people worldwide have been infected with COVID-19, with over eight hundred thousand fatalities globally as of 7th of September 2020 [28]. (WHO Coronavirus Disease (COVID-19) Dashboard, 2020). The Nigerian Federal Ministry of Health confirmed the first case of COVID-19 in Ogun State, South-West Nigeria, on 7th February 2020. Over a period of seven months, Nigeria had recorded over fifty-five thousand confirmed cases with over a thousand fatalities [16].

COVID-19 has been documented to spread mainly from person to person through infected respiratory droplets. Globally, the most effective way of reducing the spread of the virus is through regular washing of hands with soap and water, maintaining a physical distance of at least two meters, proper hygiene, and the wearing of a face mask [5,7,14,30]. In addition, precautionary measures such as nationwide lockdown were initiated by countries like Nigeria to forestall unnecessary movement thereby limiting the spread of COVID-19.

Recently published studies have highlighted the impact of the perception of threat to COVID-19 on psychological and behavioral responses ([4], p. 19; [19,27]). The psychological responses, especially anxiety and fear have been documented to lead to reluctant adoption of COVID-19 preventive behavior [19]. Behavioral response to risk communication campaigns during pandemics is often determined by people's perceived level of threat and efficacy. In the early phase of the COVID-19 pandemic in Nigeria, risk communication messages were disseminated across various media platforms such as radio, television, prints, social media, and short message service (SMS) to inform Nigerians about the associated risks and mode of prevention for COVID-19. Understanding the level of perceived threat and efficacy to COVID-19 would support the development of effective risk communication messages.

The Extended Parallel Process Model (EPPM) has been used to assess the levels of perceived threat and efficacy with respect to adherence to preventive health behaviors [3,15]. As far as the authors know, this is the first study applying the EPPM to understand COVID-19 behavioral response. This study is aimed at assessing the level of threat and efficacy across various demographic groups.

Theoretical framework

This paper draws on the Extended Parallel Process Model which was introduced by Witte [29]. It emphasizes the role of threat and efficacy as key elements required for a behavior change. The model is used to explain how individuals process and respond to fear appeal messages targeted at promoting protective health behaviors [2]. According to Carey & Sarma [6], the EPPM was developed as a framework to understand complex psychological processes triggered in response to threat messages. Since its introduction, the model has been applied extensively in health communication research [22].

The EPPM describes how the 'combination of rational considerations and emotional reactions determine behavioral decisions' (Health Communication Capacity Collaborative, 2014:1). As shown in Fig. 1, the construct of threat has two sub-components: severity (perception of the seriousness of the threat) and susceptibility (perceived probability of experiencing
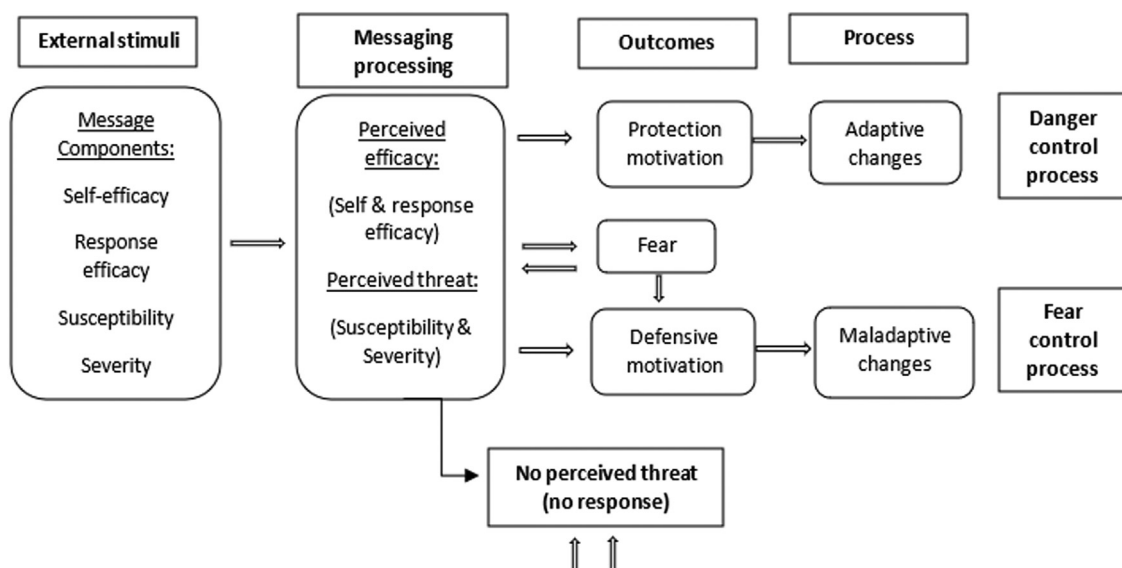

Fig. 1. The Extended Parallel Process Model. Adopted from [22].

a threat). Efficacy also has two subcomponents: response efficacy (perceived effectiveness of alternate responses to threat) and self-efficacy (belief about one's ability to perform a behavior) [8,29].

The EPPM has been used successfully to understand messaging around various preventive health programs, including building confidence in the use of vaccines [2,24], early breast cancer diagnosis [31], reduction of substance use, smoking prevention program [8,9], improvement of treatment uptake for HIV/AIDS [15], and willingness of employees to work during an influenza pandemic [26].

Methods

This was a cross-sectional study conducted across the 36 states in Nigeria, including the Federal Capital Territory. Data collection took place between May 19 and June 5, 2020. During this period, the Federal Government instituted a nationwide lockdown, however, in some of the study states the lockdown was partial. Data was collected through an online questionnaire and face to face interviews in states where lockdown was partial. The survey tool was deployed using Microsoft forms through social media platforms (Instagram, Twitter, Facebook, WhatsApp). Face to face interviewers adhered to COVID-19 preventive measures while administering the questionnaire. Convenience and snowball sampling approaches were used to recruit respondents. Participation was voluntary and only respondents aged 18 and above were eligible to participate in the study.

Survey instrument

The data collection instrument included questions on demographics, media consumption habits, perceived threat (perceived severity and susceptibility), and perceived efficacy (self and response efficacy). This survey tool was designed and administered in English. The questionnaire was designed based on existing questionnaires from peer-reviewed studies [13,20] using the EPPM framework. The Cronbach's alpha coefficient was 0.6 and 0.88 for threat and efficacy variables, respectively, this alpha value is similar to that found in other studies [10,25].

Demographic information collected included state of residence, gender, age, marital status, highest level of education attained, and primary employment. The level of exposure to COVID-19 messages was assessed by measuring the frequency of getting information from television, radio, social media, and text messages from the Nigeria center for Disease Control (NCDC). Responses were categorized into high (4 to 7 times a week) or low (0 to 3 times a week).

The perceived threat was measured with three scaled items. Questions were asked about the participant's perceived severity (1 item) and susceptibility (2 items) to COVID-19. A sample item for perceived severity included, "*I believe that COVID-19 is a serious threat to public health*" and for perceived susceptibility, "*I am at risk of getting infected with COVID-19*".

Perceived efficacy was measured with eight scaled items. Questions were asked to assess the respondent's self-efficacy (4 items) and response efficacy (4 items) to practice COVID-19 preventive measures such as handwashing, maintaining physical distance, and practicing respiratory hygiene. Examples of questions asked to assess response efficacy include: "*Washing hands frequently with soap and water is effective in preventing COVID-19 infection*"; while to assess self-efficacy, "*I can wash my hands with soap and water frequently*".

Responses to the perceived threat and efficacy questions were measured on a five-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree). None of the items were reverse coded.

Extended parallel process model variable constructs

The EPPM constructs were derived from the threat and efficacy component of the model. The threat construct was developed as a sum of participants' responses to perceived susceptibility and severity questions. The efficacy construct was developed by summing responses to self-efficacy and response efficacy questions. Based on the two EPPM key components, four categories were derived: low threat/low efficacy (LT/LE), low threat/high efficacy (LT/HE), high threat/low efficacy (HT/LE), and high threat/high efficacy (HT/HE).

The benchmark was set at the 75th percentile, values at the 75th percentile and above were high for perceived threat and efficacy. Audiences in HT/HE were considered to be in the danger control domain, while those in LT/LE were categorized in fear control. The EPPM assumes that audiences in danger control are likely to adhere to recommended preventive behaviors, while audiences in fear control will reject recommended behaviors.

Statistical analysis

Descriptive, bivariate, and multivariate analyses were performed using STATA version 14.2. Frequencies and percentages were used to describe the study population as well as the level of exposure to messages on COVID-19 across various media. A Chi-square test was used to assess the association between selected demographic variables within danger and fear control domains. A logistic regression model was constructed to estimate the effect of demographic variables and exposure to COVID-19 messages on threat and efficacy.

Table 1
Media consumption habits across demographic variables.

Demographic variables	Radio N(%)		Television N(%)		Social media N(%)		NCDC text message N(%)	
	Low	High	Low	High	Low	High	Low	High
Age								
18–28	1017 (51.16)	917 (48.84)	772 (38.83)	1216 (61.17)	271 (13.63)	1717 (86.37)	937 (47.13)	1051 (52.87)
29–39	917 (47.89)	998 (52.11)	592 (30.91)	1323 (69.09)	236 (12.32)	1697 (87.68)	955 (49.87)	960 (50.13)
40–50	322 (36.10)	570 (63.9)	229 (25.67)	663 (74.33)	167 (18.72)	725 (81.28)	406 (45.52)	486 (54.48)
51+	113 (33.93)	220 (66.07)	90 (27.03)	243 (72.97)	89 (26.73)	244 (73.27)	153 (45.95)	180 (54.05)
Gender								
Male	1150 (43.84)	1473 (56.16)	881 (33.59)	1742 (66.41)	371 (14.14)	2252 (85.86)	1269 (48.38)	1354 (51.62)
Female	1219 (48.59)	1290 (51.41)	802 (31.96)	1707 (68.04)	392 (15.62)	2117 (84.38)	1182 (47.11)	1327 (52.89)
Marital status								
Single	1379 (50.55)	1349 (49.95)	1031 (37.79)	1697 (62.21)	356 (13.05)	2372 (86.95)	1321 (48.42)	1407 (51.58)
Married	990 (41.18)	1414 (58.82)	652 (27.12)	1752 (72.88)	407 (16.93)	1997 (83.07)	1130 (47)	1274 (53)
Highest educational level								
None	22 (24.72)	67 (75.28)	73 (82.02)	16 (17.98)	76 (85.39)	13 (14.61)	67 (75.28)	22 (24.72)
Primary	13 (29.55)	31 (70.45)	31 (70.45)	13 (29.55)	40 (90.91)	4 (9.09)	33 (75)	11 (25)
Secondary	314 (44.04)	399 (55.96)	290 (40.67)	423 (59.33)	203 (28.47)	510 (71.53)	332 (46.56)	381 (53.44)
Tertiary	2020 (47.13)	2266 (52.87)	1289 (30.07)	2997 (69.93)	444 (10.36)	3842 (89.64)	2019 (47.11)	2267 (52.89)
Employment status								
Artisans/daily paid workers	127 (42.27)	172 (57.53)	136 45.48	163 (54.52)	112 (37.46)	187 (62.54)	174 (58.19)	125 (41.81)
Business/shop owners	402 (43.55)	521 (56.45)	287 (31.09)	636 (68.91)	183 (19.83)	740 (80.17)	445 (48.21)	478 (51.79)
Fully employed	924 (48.05)	999 (51.95)	562 (29.23)	1361 (70.77)	195 (10.14)	1728 (89.86)	926 (48.15)	997 (51.85)
Student/Corpers	464 (48.43)	494 (51.97)	324 (33.82)	634 (66.18)	95 (9.92)	863 (90.08)	435 (45.41)	523 (54.59)
Unemployed	452 (43.93)	577 (56.07)	374 (36.35)	655 (63.65)	178 (17.30)	851 (82.70)	471 (45.77)	558 (54.23)
Geopolitical zones								
North-Central	619 (50.37)	610 (49.63)	314 (25.55)	915 (74.45)	178 (14.48)	1051 (85.52)	601 (48.9)	628 (51.1)
North-East	376 (54.1)	319 (45.9)	274 (39.42)	421 (60.58)	138 (19.86)	557 (80.14)	344 (49.5)	351 (50.5)
North-West	215 (34.24)	413 (65.76)	215 (34.24)	413 (65.76)	125 (19.9)	503 (80.1)	280 (44.6)	348 (55.4)
South-East	189 (33.63)	373 (66.37)	186 (33.10)	376 (66.9)	82 (14.59)	480 (85.41)	270(48.04)	292 (51.96)
South-South	316 (43.11)	417 (56.89)	241 (32.88)	492 (67.12)	98 (13.37)	635 (86.63)	340 (46.38)	393 (53.62)
South-West	654 (50.89)	631 (49.11)	453 (35.25)	832 (64.75)	42 (11.05)	1143 (88.95)	616 (47.94)	669 (52.06)

Results

In total, 5132 respondents participated in the study, with a mean age of 33 years (the mean age according to the NDHS 2018 is 29 years). Eighty-three percent of respondents (83%) had tertiary education (NDHS 2018 reported 10%); 53% were single (NDHS 2018 reported 31%), and 37% were fully employed (NDHS 2018 reported 65%). Overall, respondents had very high exposure to COVID-19 messages across various platforms with social media having the highest (85%), followed by television (67%), radio (54%), and NCDC SMS (52%).

Table 2
Percentage of the audience in danger or fear control by demographic variables.

Demographic variables	Danger control (%)	Fear control (%)	Pearson chi² test
Age			
18–28	17.83	82.17	0.001
29–39	21.87	78.13	
40–50	25.00	75.00	
51+	22.47	77.53	
Gender			
Male	21.99	78.01	0.000
Female	19.61	80.39	
Marital status			
Single	18.43	81.57	0.071
Married	23.71	76.29	
Highest educational level			
None	3.70	96.30	0.000
Primary	4.65	95.35	
Secondary	19.89	80.11	
Tertiary	21.67	78.33	
Employment types			
Artisans/daily paid workers	14.17	85.83	0.004
Business/shop owners	17.69	82.31	
Fully employed	23.12	76.88	
Student/Corpers	21.62	78.38	
Unemployed	21.02	78.98	

Table 3
Regression with demographic variables and EPPM components.

Demographic variables	Total N (%)	EPPM framework components			
		Perceived susceptibility	Perceived severity	Response Efficacy	Self-efficacy
Age					
18–28	1988 (39%)	0.000	0.000	0.000	0.000
29–39	1915 (37%)	0.022	−0.021	0.048**	0.052**
40–50	892 (17%)	0.040*	−0.025	0.033	0.058**
51+	333 (6%)	0.067***	−0.008	0.033*	0.032*
Gender					
Female	2509 (49%)	0.000	0.000	0.000	0.000
Male	2623 (51%)	0.014	0.029*	−0.018	−0.024
Marital status					
Single	2728 (53%)	0.000	0.000	0.000	0.000
Married	2404 (47%)	0.016	0.064***	0.018	0.027
Highest educational level					
None	89 (2%)	0.000	0.000	0.000	0.000
Primary	44 (1%)	0.042*	0.021	0.020	0.009
Secondary	713 (14%)	0.277***	0.168***	0.240***	0.242***
Tertiary	4286 (83%)	0.359***	0.111**	0.315***	0.359***
Employment status					
Artisans/daily paid workers	299 (6%)	0.000	0.000	0.000	0.000
Business/shop owners	923 (18%)	0.014	−0.032	0.038	0.105***
Fully employed	1923 (37%)	0.078*	−0.022	0.118***	0.161***
Student/Corpers	958 (19%)	0.039	0.023	0.063*	0.118***
Unemployed	1029 (20%)	0.052*	0.006	0.074**	0.125***
Geopolitical zone					
North Central	1, 229 (24%)	0.000	0.000	0.000	0.000
North-East	695 (14%)	−0.040*	0.044**	−0.032*	−0.063***
North-West	628 (12%)	−0.042**	0.068***	−0.005	0.017
South-East	562 (11%)	−0.000	0.014	−0.008	0.020
South-South	733 (14%)	−0.007	−0.054***	−0.023	−0.013
South-West	1, 285 (25%)	0.005	−0.076***	0.009	0.033*
Exposure to COVID-19 messages across media platforms					
Radio					
Low	2369 (46%)	0.000	0.000	0.000	0.000
High	2763 (54%)	0.044**	0.110***	0.040**	0.049***
TV					
Low	1683 (33%)	0.000	0.000	0.000	0.000
High	3449 (67%)	0.083***	0.076***	0.095***	0.084***
Social media					
Low	763 (15%)	0.000	0.000	0.000	0.000
High	4369 (85%)	0.061***	0.047**	0.091***	0.099***
NCDC messages					
Low	2451 (48%)	0.000	0.000	0.000	0.000
High	2681 (52%)	0.016	0.052***	0.055***	0.061***

$P > 0.01^{***}$ $P > 0.05^{**}$ $P > 0.1^{*}$.

Descriptive analysis of the level of exposure to COVID-19 messages on radio, television, social media, and text messages from NCDC across different demographics is shown in Table 1.

Table 2 below presents the result of the chi-square test between demographic variables and the danger/fear control process. There was significant association between danger/fear control and demographic variables except marital status.

Regression analysis of the EPPM categories and demographic variables with the beta coefficients and significant levels is shown in Table 3. The results revealed that as age increases, the perceived susceptibility to COVID-19 increased. Also, as the level of education increased, respondents' perceived severity, susceptibility, response efficacy, and self-efficacy on COVID-19 increased. High exposure to COVID-19 messages across all media platforms was significantly associated with perceived severity, response efficacy, and self-efficacy, however, NCDC SMS had no significant association with respondent's perceived susceptibility to COVID-19.

Table 4 below shows the disaggregation of audiences into fear control and danger control categories, a total of 15% of respondents were engaging in danger control (HTHE) processes, and 59% were engaging in fear control (LTLE) processes. Respondents in the danger control category are more likely to take protective action to avoid or reduce the threat of COVID-19, while those in the fear control category do not feel at risk and are unlikely to take preventive steps.

Discussion

Findings from this study revealed that exposure to COVID-19 messages differed across various media platforms, with more respondents getting information from social media and television, other studies have also shown these two media

Table 4
Audience categorization on the Extended Parallel Process Model framework.

	High efficacy: Belief in the effectiveness of COVID-19 preventive solutions and confidence to practice them	Low Efficacy: Doubts about the effectiveness of COVID-19 solutions and lack of confidence to practice them
High Threat: The belief that the threat is harmful and that one is at risk of getting infected with COVID-19	15% (self-protective behaviors)	13% (denial or rejection of protective behaviors)
Low Threat: The belief that the threat is trivial and that one is not at-risk	13% (know what to do but are not really motivated to do much)	59% (People do not feel at risk and do not know what to do about it)

channels to be the highest source of knowledge on COVID-19 in Nigeria [17,21]. Also, the main source of information was social media and television, and this was consistent across all age groups. However, social media was regarded as the least reliable source of information when compared with TV, radio, and NCDC SMS.

Threat components: perceived susceptibility and perceived severity differed across groups. Notably, the perceived susceptibility of COVID-19 was higher among older people, showing that older people feel they are more likely to be affected by COVID-19. These findings are however in contrast with a study conducted among health care workers in Pakistan, which showed that age had no significant effect on attitude towards COVID-19 [23].

From this study, more than half of respondents were in the fear control domain (59%), indicating that the majority did not perceive COVID-19 as a threat and therefore were less likely to practice the recommended protective behaviors such as hand washing, maintaining physical distance and wearing a face mask. Audiences in the danger control domain (15%) were however more likely to adopt the COVID-19 protective behaviors.

There were differences in perceived threat and efficacy responses across demographic profiles. First, regarding age, more of the younger people (18–28years) were within the fear control domain when compared to those aged 50 years and above. This may be attributed to the fact that prior messages on COVID-19 were focused on older people as 'at risk' group to COVID-19, which perhaps makes them more likely to adopt the protective behaviors as a lifesaving instinct, inadvertently making younger people feel less at risk of being infected with the virus.

Also, 96.3% of respondents with no education were in the fear control domain and, as level of education increased, respondents' perceived severity, susceptibility, response efficacy and self-efficacy on COVID 19 also increased. Regarding the employment category, 85.8% of artisans/daily paid workers were mostly in the fear control category. These findings are similar to a study carried out by [23] where members of different occupation groups were also found to respond differently to the COVID-19 pandemic, however, this study was among health care workers.

The economic effects of the COVID-19 lockdown in Nigeria [11,18], especially on those in the non-formal sector may have shaped their perception of COVID-19. Practices such as maintaining physical distance, regular handwashing, and wearing a face mask seemed less practicable among this target audience. Artisans and daily-paid workers may not have access to constant water supply and find it difficult to maintain physical distancing due to the nature of their jobs. However, fully employed persons have access to systems and structures that support adherence to protective measures.

Limitation

The study was carried out during strict lockdown measures in some states, hence most respondents were reached online. However, in a few states, face to face interviews was possible as lockdown measures were relaxed. This might have a potential for selection bias against an audience that lacks access to social media or the internet.

This study utilized an observational study approach, and as such associations were only examined, as one cannot draw causal inferences.

Conclusion

This study focused on understanding the potential response to COVID-19 protective behaviors as influenced by elements of threat and efficacy. Based on the findings, we can conclude the following:

First, social media serves as a common source of information though considered unreliable by the study participants when compared with other sources, and this might be attributed to the unverifiable nature of information shared across social media. Second, levels of threat and efficacy varied across different demographic groups, and only 15% of the respondents interviewed were in the high threat -high efficacy domain. This means that very few respondents were likely to take up protective behaviors.

To develop and disseminate a more effective risk communication campaign, consideration should be given to placing an appropriate balance between threat and efficacy elements. Also, messages should address the diverse demographic population while ensuring the balance between threat and efficacy.

Future research assessing the impact of the risk communication campaign on behavioral outcomes based on the key protective behaviors of handwashing, the practice of respiratory hygiene, and maintaining physical distancing, should be considered using the EPPM theoretical framework.

Declaration of Competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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