**THE PATHWAY TO DEVELOPMENT AND MAINTENANCE OF PTSD AMONG HEALTHCARE WORKERS IN THE FIRST FIVE MONTHS OF THE COVID-19 PANDEMIC IN EKITI STATE, NIGERIA.**

**Introduction**

The World Health Organization's (WHO) declaration of Covid-19 as a pandemic [1] has shocked healthcare workers and the entire global community. The pandemic has spread across the world to over 187 nations. The virus has infected more than 90,000 Health Care Workers (HCWs), including 260 nurses who have lost their lives just in five months within 30 nations [2]. In particular, Nigeria is identified as the 13th top high-risk nation for Covid-19 importation due to its high travel volume to and from China [3]. Over 113 HCWs were infected in the past five months [4]. In Ekiti State, the Government had set up a 40-man task force to include an infection prevention control team and a case management team comprising laboratory scientists, epidemiologists, researchers, and psychologists, among others trance, test and treat diagnosed or suspected cases.

The State experienced her first confirmed case of Covid-19 on March 19, 2020, and was the cause of death of a 27 years old American [5], and her first native Covid-19 death occurred on April 22, 2020. The same patient had infected a medical doctor, and it was not sure if this doctor would survive or if his family or co-workers would be infected. Elsewhere in Nigeria, a medical doctor acquired the disease and died. His wife and children tested positive for the coronavirus [6] and are now fighting for survival. Nigeria has witnessed the death of 10 medical doctors, with 816 (6%) of all infected cases of healthcare workers nationwide as of the first five months of the pandemic.

The leading causes of health workers' death in the State and the nation have included inadequate facilities for testing Covid-19 patients leading to a shortfall of tests required. There has also been a shortage of reagents, kits, primers, aprons, hair covers, facemasks, and shoe coverings [7-9]. In addition, it took over six hours to complete a test and 24 to 48 hours for a patient to get results [10]. Research has persistently demonstrated that medical doctors and allied health workers who experienced these kinds of nosocomial and psychological traumas might attract Posttraumatic stress disorder (PSD) [11]. PTSD stands to be the most common mental health problem of healthcare workers during the Covid-19 pandemic [12]. PTSD is estimated among HWCs to be between 2.1% to as high as 73.4% in a recent Covid-19 survey conducted in Singapore [12]. Those who suffer from this disorder often avoid social interaction and events, affecting their productivity [13-15]. In addition, one area of concern among PTSD researchers is Experiential Avoidance (EA). EA is an umbrella term for cognitive avoidance, emotional avoidance/numbing behavior avoidance, avoidance coping, thought suppression, alexithymia, and other emotional regulation strategies [16-18], which often occurs when individuals avoid private thought [19]. EA contains elements of PTSD, and in the three clusters of PTSD which is the avoidance cluster has been noticed to be the primary predictor required by the DSM-V for the existence of PTSD [20].

  To this extent, the role of experiential avoidance in developing and maintaining PTSD among HWCs in Ekiti State remains unknown. Those who demonstrate these kinds of anxiety in the wave of life-threatening situations might employ EA as a coping strategy to control or escape from these emotions. However, paradoxically it contributes to the development and maintenance of PTSD [21,22] and its symptoms [23-25]. This mental health problem is common among women [26,27] and should be primarily a priority as women make up about half of the HCWs in Ekiti State.

Researchers believe that the best behavioral safety precaution for HCWs in a traumatic situation is the health belief model (HBM), without which health services might fail [25,28,29,30]. However, we believe this perception is contestable and obsolete and might not necessarily be applicable, especially at the initial stage of a disease outbreak. However, we perceived that HBM has predictive power over PTSD and EA and could serve as paths through which PTSD could be developed and maintained. Unfortunately, to our knowledge, there has been no research assessing HBM, EA, and PTSD among HCWs.

Indeed, a study that will assess relationships among these variables is needed to assist policymakers in the health sectors in mitigating the mental health effect of the covid-19 among HCWs in the earlier stages of this pandemic. In particular, we attend to assess whether HBM will mediate the relationship between EA and PTSD among HCWs in the first five months of the pandemic. In addition, such a study will help us understand how PTSD is developed and maintained among HWCs in Ekiti State. Therefore, the main objective of this study is to assess the relationship between HBM and PTSD, HBM and EA, and EA and PTSD, as well as to assess the mediating effects of HBM, Experiential avoidance, and PTSD among healthcare workers in Ekiti State first five months of the COVID-19.

**Health Belief Model and PTSD**

Indeed, HBM has six components, but for this current study, three of its components were considered appropriate for this study. Perceived susceptibility, perceived severity, and perceived barriers are considered the original components of HBM reliably measured across all cultures compared to the other components [31]. Perceived susceptibility is a subjective assessment of the risk of contracting or being harmed by a disease [32]. Individuals with high perceived susceptibility are likely to take relevant actions to reduce the risk [32]. In contrast, those with low perceived susceptibility are not likely to engage in health promotion behavior to mitigate perceived danger [33]. Also, Perceived severity, known as perceived seriousness, is a subjective assessment of the potential danger imposed by disease and its consequences [34]. For example, in a study on Covid-19 in Iran, Duan et al. [35] found that perceived severity was significantly associated with the public adoption of health promotion measures. Also, during the 2003 SARS in Hong Kong, respondents with a high risk of perceptions were more likely to take comprehensive precautionary measures against the infection [36]. At the same time, the perceived barrier is individual assessments of an obstacle to behavior change, including inconveniences, danger, medical procedures, discomfort, social consequences, and expenses [37,38].

On the other hand, PTSD is an anxiety disorder that one experiences after exposure to a traumatic event like COVID-19. According to [39], PTSD is a mental health disorder classified into three groups: re-experiencing, avoidance, and hypervigilance [14,15,40]. Considering these three clusters of PTSD, studies have shown varying levels by gender. For example, women reported a high level of re-experiencing symptoms of PTSD than men after a motor vehicle accident [41]. Studies have also demonstrated estimates of PTSD symptoms among healthcare workers to be higher than the general population and range from 6-10% in a recent Covid-19 survey conducted in Singapore [42] and 18% from nurses working in hospitals from another study [27]. A body of research shows that past infectious disease outbreaks, including severe acute respiratory syndrome (SARS), and the Middle East Respiratory Syndrome (MERS), were associated with mental health issues among HCWs [43,44], primarily PTSD and Posttraumatic stress symptoms [11]. Demographic factors like gender, age, education level, and service length are associated with PTSD among HCWs [11]. Being a woman has also been associated with PTSD, most especially during health crises [45-47].

To our knowledge, there is no direct link between HBM and PTSD in the scientific literature. However, there is a consensus that the outbreak of the coronavirus pandemic is a traumatic event (perceived severity, susceptibility) with a negative emotion. Furthermore, the cognitive theory of emotion states that negative cognition leads to negative emotion [48,49], which leads to a significant increase in anxiety, depression, and stress [50] that overlaps with PTSD [51,52] and is comorbid with PTSD [53-55]. Therefore, with the general perception that HBM is a health protection and prevention method [28,56,57], we hypothesized that an increase in a high level of three components of HBM would lead to an increase in PTSD and its components among HCWs in the first five months of the COVID-19 pandemic.

**Experiential avoidance (EA) and Health Belief Model (HBM)**

Experiential avoidance occurs when an event takes place, and an individual does not want to remain in contact with the private emotions (bodily sensations, thoughts, emotion, thinking, memories, and behavior prediction) associated with the event and does everything possible to prevent feelings from occurring [58]. The theory suggests that EA is a valuable evolutionary foundation for relieving emotional and psychological distress in life-threatening phenomena [59]. However, research demonstrated that avoiding unwanted thoughts and feelings often paradoxically increases the event's severity and maladjusted behavior [60]. Despite the adverse effects of EA, people often embark on this strategy when faced with life-stressing events because of its immediate positive outcome in reducing emotional challenges, associating EA with adaptive coping styles for trauma victims [61]. However, EA is often associated with prolonging [59], a critical process in emotional disorders, depressive symptoms [62], trauma [63], and PTSD [16,58]. Furthermore, EA often deprives people of the opportunity to experience positive feelings and emotions, making them believe that anything trauma-related is terrible and unwanted [16].

Research is silent on the relationship between EA, and HBM Researchers conceived that when one faces an observable threat (perceived severity), risk level rises (perceived susceptibility) [33]. Furthermore, when there is no means of mitigating the threat (perceived barriers), one feels vulnerable and tries to minimize the effects of the threat by escaping from its sensations [59]. Thus, the perpetual nature of EA to alter unwanted feelings or sensations might negatively affect HBM among HCWs. These findings inform further studies that invite specific covid-19 EA to assess its predictive power on HBM. Hence considering the changing nature of the virus and its nosocomial transmission rate, HCWs might operate on a high level of Perceived threat (susceptibility and severity) and barriers due to a high level of inability to assess resources [7].

Furthermore, researchers observed EA as a short-time strategy for managing emotional expression [64]. Other studies have demonstrated that fear of being infected negatively affects public mental health, reporting increased depression and anxiety [65-67]. We, therefore, hypothesized that experiential avoidance would predict the three components of HBM among HCWs in Ekiti State in the first five months.

**Experiential avoidance (EA) and Posttraumatic Stress Disorder (PTSD)**

One area of concern among PTSD researchers is experiential avoidance. EA is an umbrella term for cognitive avoidance, emotional avoidance/numbing behavior avoidance, avoidance coping, thought suppression, alexithymia, and other emotional regulation strategies [68]. Although EA is a widely researched component of psychological inflexibility [69-71], given that EA contains elements of PTSD. In the three clusters of PTSD, the avoidance cluster is a primary predictor required by the DSM-V for the existence of PTSD [20]. Considering that theory has found that at the initial stage of a catastrophic event, experiential avoidance would be unavoidably employed as a coping mechanism [59,72], we perceived that HCWs could use this variable as a relief, and it might have some predictive power of PTSD.

  EA often occurs when an individual is unwilling to remain in touch with private thoughts, emotions, feelings, sensations, and memories and take actions to change the experience of these events [59]. The avoidance aspect of EA is made of subsequent attempts to reduce the negative private experience. In this way, EA has been considered a negative emotional or coping strategy linked to psychopathology [59]. However, EA is part of our daily life, as humans who most often socialize to contain specific behavior to enhance social approval, especially in light of COVID-19 to enhance safety. Correspondingly, EA is often adaptive for the traumatic victim if it helps victims to identify and avoid similar traumatic events [68].

Furthermore, EA has positive and short time outcomes when used in thought suppression only once [73]. Furthermore, EA is associated with recovery from a traumatic event and several life-threatening experiences [74,75]. In this way, EA might not have any predictive strength on PTSD but whether this perception applies to health workers within the earlier stage of this pandemic is yet to be proven.

Conversely, PTSD is a mental health disorder with clusters of emotional numbness or avoidance. This cluster is high among healthcare workers, ranging from 2.1% to 73% [76]. Due to the increased risk of contagiousness of the covid-19 in the hospital due to unsafe work settings, lack of personal protective equipment, and health belief systems [11], the level of PTSD could be high. Prevention of PTSD among HCWs has been challenging [11] because of the avoidance and re-experiencing nature of PTSD in the victims' unconscious nature.

Indeed, EA has demonstrated the predictive power of PTSD total symptoms of severity [77,78], and in addition, EA can maintain PTSD intrusion and symptoms [79]. Furthermore, many researchers working on PTSD development have demonstrated several relationships between PTSD and EA. For example, some research suggests that attempts to avoid negative emotional experiences can maintain not only PTSD but also worsen PTSD symptomatology [60,80,81].

Considering that those with PTSD sometimes avoid places, people, and events and EA is an unconscious adaptive emotion, it is crucial to examine its effects on PTSD among HCWs in Ekiti. Furthermore, this study is critical as EA is an evolutionary approach to tragic events [69,70].

**The Mediating effects of HBM and EA on PTSD**

HBM aims to enlighten why people do not adhere to health promotion strategies [32]. For example, reasons why people do not wear face masks, Personal Protective Equipment PPE, and use hand sanitizer [32,34]. Furthermore, it encourages people to engage in preventive and to promote healthy measures [32]. The health belief model is a cognitive strategy, which in this context will be the perception that the pandemic is severe; therefore, one is susceptible to it; and there are obstacles or impediments (barriers) in preventing its contractions. For example, studies suggest that when people are convinced about the severity of a disease, they feel susceptible to it. This perception will make them more likely to adopt a precautionary behavior and be willing to adopt a recommended behavior with the belief that it will be cost-effective [82-86].

However, we observed that this perception is contestable, especially in the earlier stage of a pandemic where it has overwhelmed entire developed and developing nations, and the virus has no treatment or vaccine. We, therefore, perceived HBM could be a painful catastrophic factor inhabiting PTSD due to its cognitive and emotional contents. However, this perception has yet to be investigated in the literature, creating a knowledge gap. To bridge this research gap, we conducted this study to help policymakers revisit the appropriate timing and circumstances regarding the suitability of HBM in an earlier pandemic outbreak.

**Method**

**Design**

This research employed an exploratory research design. The design is necessary, especially when dealing with problems in a preliminary stage, like the new coronavirus, which presents a challenge to collect data considering the contagious nature of the disease.

**Setting and participants**

We conducted this study in Ekiti State, Southwest Nigeria. Nigeria has one of the highest infection rates in West Africa and the 5th highest in Africa (BBC, 2020). We conducted this current study among healthcare workers involved in the first five months of the covid-19 pandemic. The participants include medical doctors, nurses, and allied health workers (pharmacists, laboratory scientists, epidemiologists, environmental health workers, community health extension workers, radiologists, psychologists, and physiologists in Ekiti State. The study took place in both primary, secondary, and tertiary institutions. We collected data between May 5 and June 18, where each respondent (HCW) provided informed consent before participating in the survey to guarantee confidentiality and adhere to ethical standards.

1. Experiential avoidance (EA)

The Acceptance and Action Questionnaire-II (AAQ-II). The AAQ-II is a 7-item and a stable measure and a current standard for measuring experiential avoidance [87]. The EA is a 7-point scale ranging from never true (1) to away true (7). High score indicates lower level of experiential avoidance. The content of the items included participants' willingness to be in contact with adverse private events, the acceptance of these events, and how effectively they can pursue their goals in life. The summation of the scores resulted in a total score ranging from 7 to 49, where a higher score indicates lower level of experiential avoidance. The AAQ-II has a mean alpha coefficient of .84 (ranging from .78 to .88) and a strong test-re-test reliability of .81 and .79 after 3-12 months [87]. The AAQ –II has recently been reported high with measures of neuroticism compared to another measure of experiential avoidance [87].

**2. Health Belief Model scale**

Victoria Champion developed this Scale. We adopted it and used it based on her recommendation [88]. The questionnaire originally consisted of 42 items addressing health belief model variables. In addition, five questions examine perceived susceptibility, seven on perceived seriousness/severity, six on perceived barriers, eleven on perceived confidence, and seven on health motivation. For the current study, we used three components. These include Perceived susceptibility, which measured 11 items. In addition, the items assess respondents' views of how likely Covid-19 is affecting them. We also measured Perceived severity with ten items assessing respondents' views of how serious the covid-19 is to them, and perceived barriers, measured with 16 items assessing respondents' views of the obstacles they face in fighting covid-19.

   We formulated all items for the three subscales used in this current study with a 5-point Likert-type scale from strongly disagree (1) to agree (4) strongly agree. The researchers scored the Scale is scored so that a higher score means more significant perceived barriers.

   The scales were assessed for content validity by a panel, and the results show that perceived susceptibility, severity, and barriers have a Cronbach's alpha of 0.90, 0.80, and 0.80, respectively, with a test re-test of 0.70,0.45, and 0.45 [89].

      Posttraumatic Stress Disorder Checklist (Civilian Version) (PCL) C. The PTSD Checklist Civilian Version PCL-C/S was developed by [90]. It assesses trauma symptoms that align with the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders. The Scale contains 17 items that ask respondents how often they have been bothered by each symptom in the past months on a five points severity scale. We scored this instrument by adding all the items for a total severity scale. We considered a total score of 44 PTSD-positive—the statement in the PCI-S addresses three areas of the DSM IV. The IB item is re-experiencing symptoms 1-5; 3 are the emotions avoidance symptoms 6-12, and the 2D is the hyper-vigilance symptoms (13–17).

Researchers have found the reliability of the PCL-C or PCL-5 to be robust. For example, in a sample of motor vehicle accident and sexual victims, 18 had PTSD with an alpha of .94 [91]. In addition, researchers reported a validity of .86. A test-re-test of .80 for individuals in France who had experienced the severity of traumatic events [92].

**Validation and reliability of the Instrument**

The questionnaire was designed based on previous studies [87,88,93]. To increase the validity and reliability of the questionnaire, seven experts reviewed and revived them after conducting a cognitive test to ensure that the questionnaire was suitable to measure its intended purpose. The researchers obtained the reliability of the data through a test-re-test that yielded Cronbach alpha values of 0.89.

**Data Analysis**

We conducted descriptive statistics and Pearson's correlation with the help of IBM SPSS VERSION 20.0. Structure equation modeling (SEM) was performed in SPSS AMOS 28 using the maximum likelihood estimation method. Four hundred seventy-five participants made up of 64% female and 36% male within the age range of 25-80, responded to the questionnaire. We assessed model fit using both absolute X2 statistics) and standard relative fit indices such as the standardized root-mean-square residual (SRMR), the root-mean-square of approximation (RMSEA), and the comparative fit index (CFL). For absolute fitness, the X2 value must be non-significant (e.g., p<0.5), while the CFL must be greater than .90. SRMR and SRMSEA should be less than .06 for relative fitness [94]. Data distributions of all continuous variables were moderately normal, given that kurtosis and skewness scores were between -1 and 1 (Blanca et al., 2013). We used the leading replacement methods for handling replacement values as the numbers of the case were less than 5% [95]

**Results**

We presented data regarding the socio-demographics of participants in table 1. There were more females (64%) than males (36%). The majority of the sample were aged 25-35 (46.7%), married (76.4%), held a first degree/higher national diploma certificate (45.3%), and had between 1 to 5 years of work experience and work in public health settings (81.9%). An almost equal number of participants work in primary (41.9%) and tertiary healthcare settings (40.4%).

**Table 1.** **Social-demographics data**

|  |  |  |
| --- | --- | --- |
| N = 475  Variables | n | % |
| Sex |  |  |
| Male | 171 | 36 |
| Female | 304 | 64 |
| Age (in years) |  |  |
| 25-35 | 222 | 46.7 |
| 36-46 | 133 | 28 |
| > 46 | 120 | 25.3 |
| Marital status |  |  |
| Married | 363 | 76.4 |
| Not Married | 112 | 23.6 |
| Education |  |  |
| Postgraduate | 117 | 24.6 |
| First degree/Higher National Diploma | 215 | 45.3 |
| Midwifery and Nursing Certificate | 93 | 19.6 |
| OND | 50 | 10.5 |
| Designation |  |  |
| Doctors | 108 | 22.7 |
| Nurses | 177 | 37.3 |
| Others | 190 | 40 |
| Years of practice |  |  |
| 1-5 | 153 | 32.2 |
| 5-10 | 111 | 23.4 |
| 11-15 | 94 | 19.8 |
| > 15 | 117 | 24.6 |
| Type of healthcare setting |  |  |
| Primary | 199 | 41.9 |
| Secondary | 84 | 17.7 |
| Tertiary | 192 | 40.4 |
| Ownership of healthcare setting |  |  |
| Public | 389 | 81.9 |
| Private | 86 | 18.1 |

**Table 2.**  **Means, standard deviations and bivariate correlations**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| N = 475 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Sex (1) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Age (2) | -.20\*\* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Marital status (3) | .09 | -.34\*\* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Education (4) | .32\*\* | -.20\*\* | .21\*\* |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Designation (5) | .35\*\* | -.06 | .02 | .23\*\* |  |  |  |  |  |  |  |  |  |  |  |  |
| Job tenure (6) | -.22\*\* | .64\*\* | .28\*\* | -.15\*\* | -.06 |  |  |  |  |  |  |  |  |  |  |  |
| Healthcare setting (7) | -.13\*\* | .08 | -.05 | -.23\*\* | -.32\*\* | .08 |  |  |  |  |  |  |  |  |  |  |
| Ownership of setting (8) | .09\* | -.30\*\* | .18\*\* | .18\*\* | .07 | -.26\*\* | -.40\*\* |  |  |  |  |  |  |  |  |  |
| Experiential avoidance (9) | .01 | .02 | .14\*\* | -.04 | .18\*\* | .08 | -.11\* | -.10\* |  |  |  |  |  |  |  |  |
| Perceived susceptibility (10) | -.07 | .04 | -.06 | -.10\* | -.10\*\* | .03 | .22\*\* | -.18\*\* | .07 |  |  |  |  |  |  |  |
| Perceived severity (11) | .06 | .04 | -.19\*\* | -.06 | -.04 | .07 | .07 | -.08 | .08 | .51\*\* |  |  |  |  |  |  |
| Perceived barrier (12) | .07 | -.03 | -.14\*\* | -.02 | .06 | .002 | -.05 | -.14\*\* | .19\*\* | .34\*\* | .52\*\* |  |  |  |  |  |
| Re-experiencing (13) | .11 | -.02 | -.01 | .02 | .18\*\* | -.05 | -.20\*\* | .18\*\* | .40\*\* | .04 | .15\*\* | .20\*\* |  |  |  |  |
| Avoidance (14) | .21\*\* | -.15\*\* | -.11 | .08 | .20\*\* | -.14\*\* | -.13\*\* | .13\*\* | .42\*\* | .00 | .09\* | .17\*\* | .71\*\* |  |  |  |
| Hyper-vigilance (15) | .16\*\* | -.07 | .02 | .02 | .13\*\* | -.03 | -.11\* | .07 | .36\*\* | .02 | .10\* | .23\*\* | .69\*\* | .70\*\* |  |  |
| PTSD (16) | .18\*\* | -.09\* | .05 | .05 | .19\*\* | -.08 | -.17\*\* | .14\*\* | .44\*\* | .02 | .13\*\* | .22\*\* | .89\*\* | .91\*\* | .88\*\* |  |
| Mean | - | - | - | - | - | - | - | - | 14.43 | 33.12 | 23.90 | 44.91 | 9.39 | 11.16 | 9.79 | 30.34 |
| SD | - | - | - | - | - | - | - | - | 8.04 | 6.05 | 5.22 | 7.33 | 4.36 | 4.90 | 4.21 | 12.05 |

\*\*. Correlation is significant at the 0.01 level (2-tailed); \*Correlation is significant at the 0.05 level (2-tailed)

Sex (male = 0, female = 1); Age (25-35 = 0, Above 35 = 1) Marital status (married = 0, unmarried = 1); Education (first degree = 0, others = 1); Designation (doctors = 0; Nurses & others = 1); Job tenure (1-10yrs = 0, > 10yrs = 1); Healthcare setting (primary = 0, secondary = 1); Ownership of setting (public = 0; private = 1)

**Bivariate associations of socio-demographic variables with continuous variables.**

Table 2 presents correlations among variables. Sex was significantly associated with PTSD (r = .18, p < .001) and its dimensions of avoidance (r = .21, p < .001) and hypervigilance (r = .16 p < .001). Particularly, being female was associated with PTSD, avoidance, and hypervigilance. Lower age was associated with avoidance (r = -.15, p = .001) and weakly correlated with PTSD (r = -.09, p = .04). Re-experiencing (r = .18, p < .001), avoidance (r = .20, p < .001), hypervigilance (r = .13, p = .006) and PTSD (r = .19, p < .001) were associated with being a nurse/other health workers. Practicing in primary healthcare setting was associated with re-experiencing (r = -.20, p < .001), avoidance (r = -.13, p = .003), hypervigilance (r = -.11, p = .02) and PTSD (r = -.17, p < .001). Working in a private healthcare setting was also correlated with PTSD (r = .14, p = .002), re-experiencing (r = .18, p < .001), and avoidance (r = .13, p = .006).

**Bivariate associations among continuous variables**

Experiential avoidance was moderately and positively related to PTSD and its subscales, with coefficients ranging from r = .36 to .44, p < .001. However, experiential avoidance was positively related to the perceived barrier (r = .19, p < .001). However, not perceived susceptibility (r = .07, p = .14) and perceived severity (r = .08, p = .07). On the other hand, Perceived barrier and perceived severity were positively associated with PTSD and its subscales with coefficients ranging from r = .09 to .23. However, perceived barrier showed a stronger association with PTSD than perceived severity. Perceived susceptibility was not related to PTSD and its dimensions.

**Hypothesis one: Experiential avoidance will significantly predict PTSD.**

\*\*. Correlation is significant at the 0.01 level (2-tailed); \*Correlation is significant at the 0.05 level (2-tailed)

Sex (male = 0, female = 1); Age (25-35 = 0, Above 35 = 1) Marital status (married = 0, unmarried = 1); Education (first degree = 0, others = 1); Designation (doctors = 0; Nurses & others = 1); Job tenure (1-10yrs = 0, > 10yrs = 1); Healthcare setting (primary = 0, secondary = 1); Ownership of setting (public = 0; private = 1)

Diagram

Description automatically generated

**Figure 1.****Direct effect of experiential avoidance PTSD controlling for demographic variables**

Table 3 displays the results of path analyses with unstandardized estimates and p-values. The model fit was very good, χ2 (61) = 135.06, p < .001; CFI = .97; RMSEA = .05 [90% CI = (.04, .06)], SRMR = .04.

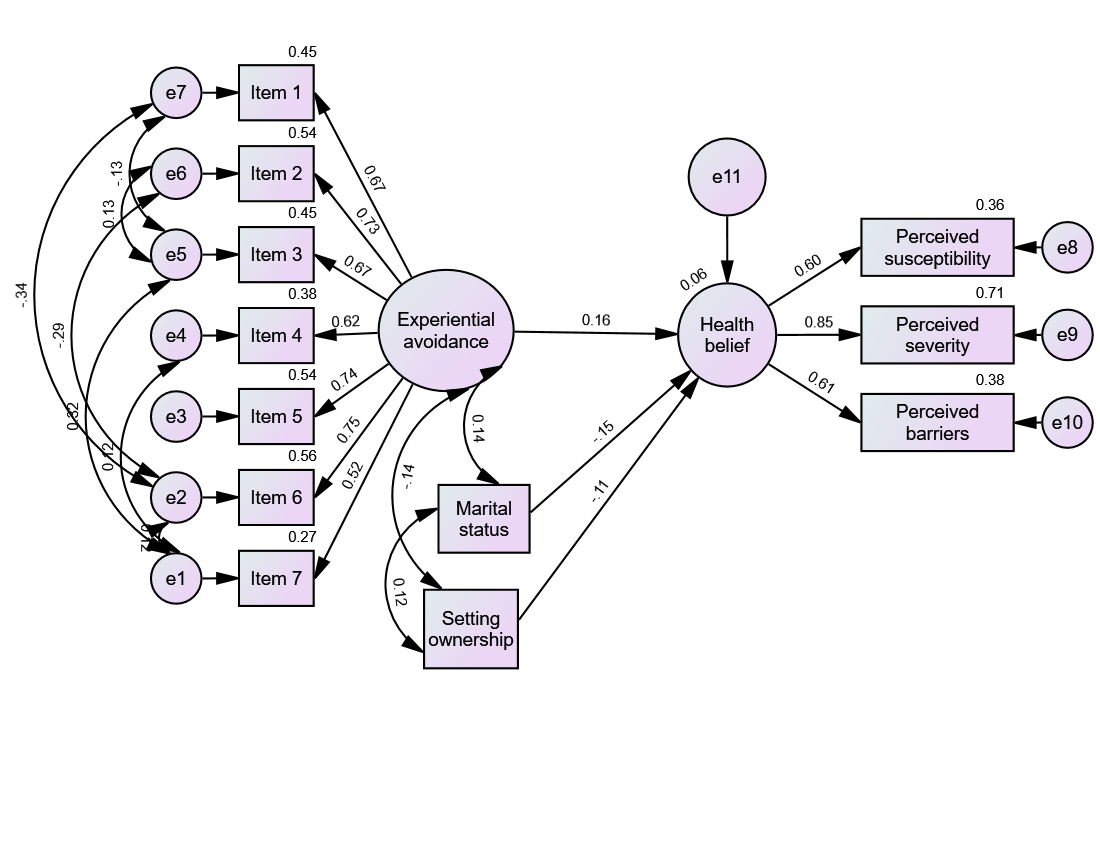
Experiential avoidance (β = .50, *p*< .001) significantly predicted PTSD. Specifically, an increase in experiential avoidance predicted greater PTSD symptoms. Sex (β = .16, *p*< .001) and ownership of healthcare setting (β = .18, *p*< .001) were significant on PTSD while designation (β = -.02, *p* = .32) and type of setting (β = -.05, *p* = .73) were not. Being female and working in a private healthcare setting was associated with PTSD. The model explained a 31% variance in PTSD.

Therefore, hypothesis one is supported.

**Table 3. Summary of direct effect of experiential avoidance and control variables on PTSD**

|  |  |  | **Estimate** | **S.E.** | **C.R.** | **P** |
| --- | --- | --- | --- | --- | --- | --- |
| PTSD | <--- | Experiential avoidance | 2.18 | .27 | 8.09 | < .001 |
| PTSD | <--- | Ownership setting | 1.66 | .45 | 3.70 | < .001 |
| PTSD | <--- | Sex | 1.20 | .35 | 3.46 | < .001 |
| PTSD | <--- | Designation | .42 | .42 | .99 | .32 |
| PTSD1 | <--- | Type of setting | -.13 | .36 | -.35 | .73 |

**Hypothesis two: Experiential avoidance (EA) will significantly predict health belief model (HBM).**

In hypothesis two, we specified experiential avoidance as the independent variable, and the health belief model was the dependent variable. At the same time, marital status and ownership setting were included as control variables because they were related to the health belief model, as shown in Table 1. Finally, we presented in figure 2 the barrier, the path diagram with standardized estimates.

**Figure 2. Direct effect of experiential avoidance on health belief model controlling for demographic variables**

Results of path analyses with unstandardized estimates and p-values are displayed in table 4. The model fit was satisfactory, χ2 (44) = 138.36, p < .001; CFI = .94; RMSEA = .007 [90% CI = (.06, .08)], SRMR = .04. Results show that experiential avoidance EA (β = .16, *p*= .005) significantly predicted health belief model. Specifically, an increase in experiential avoidance predicted greater perceived susceptibility, severity, and barrier. Marital status (β = -.22, *p*< .001) was significant on health belief model while and ownership of healthcare setting was not (β = -.09, *p* = .08). Being married was associated with health belief model. The model explained 8% variance in health belief model. Therefore, hypothesis two is supported.

**Table 4. Summary of direct effect of experiential avoidance and control variables on health belief model**

|  |  |  | **Estimate** | **S.E.** | **C.R.** | **P** |
| --- | --- | --- | --- | --- | --- | --- |
| Health belief | <--- | Experiential avoidance | .673 | .24 | 2.89 | .005 |
| Health belief | <--- | Marital status | -1.81 | .46 | -3.96 | \*\*\* |
| Health belief | <--- | Ownership setting | -.83 | .47 | -1.74 | .08 |

**Hypothesis three: Health belief model will significantly predict PTSD.**

In hypothesis three, health belief model (HBM) was specified as the independent variable, PTSD as dependent variable while sex, ownership of healthcare setting, type of setting and designation were included as control variables because they were related with PTSD as shown in table 1. The path diagram with standardized estimates is presented in figure 3.

Diagram

Description automatically generated

**Figure 3: Direct effect of health belief model on PTSD controlling for demographic variables**

Table 5 shows the results of path analyses with unstandardized estimates and p-values. The model fit was very good, χ2 (24) = 94.69, p < .001; CFI = .95; RMSEA = .08 [90% CI = (.06, .10)], SRMR = .05.

Results show that the health belief model (β = .21, *p*< .001) significantly predicted PTSD. Specifically, an increase in health belief (perceived susceptibility, severity, and barrier) predicted greater PTSD symptoms. Sex (β = .11, *p* = .02), ownership of healthcare setting (β = .13, *p* = .01) and designation (β = .14, *p* = .01) significant on PTSD while type of setting (β = -.09, *p* = .10) did not. Being female and working in a private healthcare setting was associated with PTSD. The model explained a 12% variance in PTSD.

Therefore, hypothesis three is supported.

**Table 5. Summary of direct effect of health belief model and control variables on PTSD**

|  |  |  | **Estimate** | **S.E.** | **C.R.** | **P** |
| --- | --- | --- | --- | --- | --- | --- |
| PTSD | <--- | Ownership setting | 1.24 | .49 | 2.51 | .01 |
| PTSD | <--- | Sex | .86 | .38 | 2.25 | .02 |
| PTSD | <--- | Designation | 1.19 | .46 | 2.59 | .01 |
| PTSD | <--- | Type of setting | -.66 | .40 | -1.66 | 10 |
| PTSD | <--- | Health belief model | .17 | .05 | 3.74 | <.001 |

**Hypothesis four: Health belief model will significantly mediate the association between experiential avoidance and PTSD symptoms**

In hypothesis four, we specified experiential avoidance as the independent variable, PTSD as the dependent variable, and the health belief model as mediating variable. In a preliminary mediation model, the socio-demographic variables of sex, designation, ownership, and type of healthcare settings were tested on PTSD as control variables since they were significantly correlated, as presented in table 2. Results showed that sex (β= .15, p <.001) and setting ownership (β= .07, p <.001) significantly influenced PTSD while designation (β= .15, p = .12) and type of healthcare setting (β= -.03, p = .54) were not. Hence, we only included sex and ownership settings in the final mediation model.

We presented the mediation model in figure 4 with standardized estimates. The model met the acceptable criteria for relative fit, χ2 (78) = 207.82, p < .001; CFI = .95; TLI = .93, RMSEA = .059; SRMR = .05, explaining a variance of 33% in PTSD. Factor loadings of the indicators of PTSD, health belief model, and experiential avoidance were all significant and high, thus demonstrating the fitness of measures. Experiential avoidance had significant direct effects on the health belief model (β= .14, p = .001) and PTSD (β= .49, p <.001). An increase in experiential avoidance predicted an increase in both PTSD and health beliefs. The direct effect of the health belief model was significant on PTSD (β= .13, p = .009). An increase in health beliefs predicted an increase in PTSD. The control variables of sex (β= .17, p < .001) and setting ownership (β= .20, p = .009) were also significant on PTSD.

Diagram

Description automatically generated

**Figure 4. Mediating effect of health belief model on the relationship between experiential avoidance and PTSD symptoms controlling for sex and ownership setting**

*Mediation analyses:*In a structural equation modeling framework, confirming a mediating hypothesis depends on the statistical significance of both indirect and total effects [96]. Thus this is not conclusive. The model shows that the total effect of experiential avoidance on PTSD was significant (β= .51, p < .001). We displaced in table 6 the indirect effect of experiential avoidance on PTSD through the health belief model with 90% and 95% bias-corrected confidence intervals.

**Table 6. Bias-corrected unstandardized 90% and 95% confidence intervals for the indirect effect of experiential avoidance on PTSD**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mediated path | 90% CI | | Estimate | 95% CI | |
| Lower bound | Upper bound | Lower bound | Upper bound |
| Experiential avoidance > Health belief > PTSD | .02 | .19 | .08 | .01 | .22 |

Given that the 90% and 95 confidence intervals for indirect effect did not pass through zero, the study established that the health belief model significantly mediated the relationship between experiential avoidance and PTSD. However, this result is a partial mediating effect since the direct effect of experiential avoidance on PTSD is still significant.

Therefore, hypothesis four is supported.

**DISCUSSION**

This study aims to assess the relationship between HBM and PTSD, HBM and EA, and EA and PTSD, as well as evaluate the mechanism through which PTSD is developed and maintained in HCWs five months after the covid-19 pandemic in Ekiti State. Our findings indicate that the prevalence of PTSD among medical doctors is 9.3 %, Nurses 18.6%, and allied health workers 14.2%. The study shows that some modifying variables, such as female, married, lower age, working in primary health care, and working in a private hospital, are strongly associated with PTSD. Being a female is strongly related to emotional avoidance symptoms of PTSD. Working in the primary health setting is also associated with re-experiencing symptoms of PTSD. Furthermore, working in the private health sector also strongly correlates with the hypervigilance symptoms of PTSD. These current findings find support in previous studies that PTSD was high among healthcare workers ranging from 2.1% to 73% [46,76,97], and that avoidance cluster is a primary predictor required by the DSM-V [20]

The results of this current study demonstrated that being female, married, young, designated, and working in primary and private healthcare sectors are risk factors for developing and maintaining PTSD during the pandemic outbreaks at its earlier stage. In addition, the results suggested that the three symptoms of PTSD were high among healthcare workers in Ekiti State during the first five months of the Covid-19 pandemic.

Our first hypothesis demonstrated that the health belief model (HBM) predicts PTSD and its symptoms. That is, perceived barriers and severity individually and jointly predict PTSD. More importantly, perceived barriers show a robust association with PTSD more than perceived severity. This current finding was confirmed in the literature that there are inadequate facilities for testing Covid-19 patients, inadequate testing efforts, insufficient reagents, kits, primers, aprons, hair covers, face masks, face shields, and shoe coverings [7-9]. One of the contributing factors to the development of PTSD among HCWs could be the barriers of taking over six hours to complete a test and 24 to 48 hours for a patient to get results [10]. Indeed, the three components of HBM explained 21% of the variant in PTSD.

  Although perceived susceptibility failed to predict PTSD in the current study, it is not surprising as susceptibility has a slight variance with severity. However, the average person sees these two constructs as inseparable [98], which have often been combined and defined as a perceived threat [99]. Therefore, considering the emotional and psychological distress associated with the pandemic, an average HCW could presume perceived severity for perceived susceptibility. Moreover, these perceptions could raise the level of PTSD. Moreover, it provides insights into why perceived severity and barriers predicted emotional avoidance, hypervigilance, and re-experiencing symptoms of PTSD in this current study.

To our knowledge, no previous research has linked HBM and PTSD. Nevertheless, a significant relationship between HBM and PTSD aligns with depression, as research has found HCWs who are high on HBM (severity, susceptibility, and barrier) are high on depression [100], state anxiety [101], negative coping styles [102] which are comorbid with PTSD. This current finding suggests that at the earlier stage of a pandemic outbreak, usage of HBM could trigger mental health problems in HCWs and create PTSD and its symptomatology. Therefore, HBM could not be an ideal health prevention strategy earlier in the pandemic outbreak.

Our second hypothesis found that experiential avoidance (EA) predicts HBM among Health care workers in Ekiti State for five months during the Covid-19 outbreak. More so, EA predicts perceived susceptibility, severity, and barriers in HCWs. The emotional processing theory cements the association between EA and HBM [103] that pathological fear structures resist modification due to behavior and cognitive avoidance. Healthcare workers treating a virus with a high transmissible rate without treatment and vaccine could build a pathological fear structure that could deny HBM positive emotion, making it irrelevant. This perception is reported in the literature that EA often deprives people of the opportunity to experience positive feelings and emotions, making them believe that anything trauma-related is terrible and unwanted [16].

Also, the fact that EA often alters and controls bodily sensations, feeling, thoughts, and emotions could explain why HBM could be a dismissible cognition in the first five months of the pandemic among HCWs in Ekiti State. This explanation is justified in this current study that EA is associated with prolonging suffering [59], an essential process in emotional disorder and depressive symptoms) [104] which is a negative coping strategy that operates as a barrier to well-acceptable goals/values.

The third hypothesis demonstrates that experiential avoidance (EA) predicts posttraumatic stress disorder (PTSD) and its symptomology even after controlling for sex, designation, ownership, and types of healthcare among HCWs in the first five months of the pandemic. The result indicated that experiential avoidance contributed 50% of the variance in PTSD, which proves why EA predicts emotional avoidance, re-experiencing, and hypervigilance in this current study. This finding is consistent with previous studies that have found that the emotional avoidance/numbing cluster of PTSD is embedded in EA [16,17]. In contrast, research has found that the avoidance cluster of PTSD is the main predictor required by the DSM-V to be diagnosed with PTSD [16,20]. This result suggests that the more HCWs avoid/alter distressing thoughts, feelings, emotions, or sensations of the pandemic, the more their level of PTSD increases during the first five months. The instance that EA predicts PTSD and its three clusters might mean that a high level of EA endangers PTSD, implying that EA could lead to the development and maintenance of PTSD among healthcare workers in Ekiti State during the early period of Covid-19. Thus, the theory that EA is an adaptive emotion for a patient in the initial stage of a life-threatening event [59,72] is contested, especially in the earlier stage of the pandemic outbreak.

Lastly, we tested a theoretically grounded model wherein HBM mediated the relationship between EA and PTSD. To our knowledge, this is the first study supporting the mediating roles of HBM in the relationship between EA and PTSD. Indeed, HBM fully mediated the relationship between EA and PTSD, suggesting that the relationship between EA and PTSD can be explained by the diminishing effects of perceived severity, susceptibility, and barriers imposed by the pandemic during its first five months. Furthermore, the results show the total effects of EA and PTSD without the mediating variable. At the same time, there is a direct effect of EA and PTSD in the mediating variable and indirect effects of EA and PTSD with the mediating variable of HBM.

Indeed, some basic tenets of the cognitive theory of emotion, which posits that negative cognition can lead to negative emotion [48,49,105], explain the Mediating roles of HBM (perceived severity, susceptibility, and barriers) forming pathways between EA and PTSD. This study suggests that in an acute stage of a pandemic, HBM could be emotionally laden and a positive path to enabling PTSD, implying HBM might not be a proper path for health prevention in the earlier stage of a pandemic outbreak. The finding that components of HBM explained the relationship between PTSD and EA during the coronavirus outbreak means that HCWs perceived the. Pandemic to be a threat (severe and susceptible) [28]. Moreover, levels of PTSD increased when HCWs heard about barriers such as unresponsiveness, unpreparedness, and lack of treatment and vaccines for the virus.

**Implications and recommendations of the study**

This study makes significant theoretical and empirical contributions to knowledge. The main objective of this current study is to assess the relationship between HBM and PTSD, HBM and EA, and EA and PTSD, as well as to determine the mediating effects of HBM, experiential avoidance, and PTSD among healthcare workers in Ekiti State during the first few months of the theCOVID-19 pandemic by articulating why HBM and EA maintain the development and maintenance of PTSD among healthcare workers in Ekiti State, at the earlier stage of the coronavirus pandemic. The study unfolds that the mechanism through which PTSD is developed and maintained among HCWs is through the processes of components (perceived severity, susceptibility, and barrier) of HBM. By doing so, the study projects HBM as a pathological fear structure at an earlier stage of a pandemic outbreak among HCWs. This finding is significant since literature has always presented HBM as a health preventive and promotion method, and research is almost silent on the contributions of HBM to PTSD among healthcare workers. In doing so, this current study helps closes these knowledge gaps between EA and some components of HBM, boarding the factors where EA can is seen as a transdiagnostic disorder and its contribution to developing and maintaining PTSD among HCWs.

  Therefore, practitioners and policymakers should exercise caution in using perceived severity, susceptibility, and barrier of HBM as health prevention and promotion strategies due to its correlations with the cognitive theory of emotion [48,49,105], which has found that negative emotion produces negative emotion.

Considering that EA is often initially used to receive emotional relief from life-threatening situations [72] and EA contains elements of PTSD's avoidance cluster which have been observed as the main predictor of PTSD [20], healthcare workers should employ psychological flexibility to assist in reducing the effects of EA on PTSD and HBM. Furthermore, given its focused-on value-driven behavior, employing psychological flexibility with the integration of the ACT model, there will be a low level of negative emotion that might enhance value-oriented behavior among HCWs in Ekiti State.

**Limitations of the study**

Notwithstanding, this current study has some potential limitations. First, the data were collected five months after Nigeria's inception of the Covid-19 pandemic. There was a high level of anxiety and fear among healthcare workers in Ekiti State, and at the time, patients were infecting most HCWs. This level of anxiety might have had a profound effect on the results of this current study. Therefore, further investigations could replicate this current study for a year or over since the coronavirus pandemic. Secondly, this study used an exploratory research design where most of the information about the virus has yet to be made available, and some of the constructs have not been previously studied. However, with the available results of the study, it is recommended that further researchers can embark on descriptive research design to give a better understanding of why and how HBM negatively mediated the relationship between EA and PTSD. Despite these limitations, the result of this current study is beneficial in the health sectors during the wave of this coronavirus pandemic and similar outbreak in the future.

**Conclusion**

Working in healthcare facilities and being a female are associated with PTSD and its symptomology. Our results confirm that HBM predicts PTSD, and EA and EA predict PTSD. The study also shows that HBM medicates the relationships between EA and PTSD, and there was a direct relationship between EA and PTSD during the first five months of the covid-19 outbreak in Ekiti State. High level of PTSD among HCWs can be explained by components of HBM. We therefore recommended that the treatment of HCWs should focus on increasing psychological flexibility, and Healthcare practitioners should consider usage of HBM cautiously during pandemic

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