

Impact of COVID-19 on Food Overconsumption: A Moderated Mediation Model

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Abstract

COVID-19 pandemic has brought enormous changes in dietary preferences of people. Fear of lockdowns, movement restrictions and anticipation of shortages of food and groceries changed their attitude. Hence, they started to hoard foods in bulk quantity and consequently, overconsumption has increased among people. However, health conscious people also changed their dietary habits and shifted to nudge behavior and physical exercises. Thus, this study has been conducted to explore the impact of COVID-19 risk perception on the hoarding intention and dietary habits of people. Further, relationships among food hoarding, overconsumption and nudge behavior has also been investigated. Data have been collected from 302 respondents through online survey. SPSS-19.0 and PROCESS Macro 3.0 have been used to analyze data. The findings reveal significant positive relationships between risk perception and attitude as well as attitude and hoarding intentions. Risk perception and hoarding intentions are indirectly related with each other. Further, a significant positive relationship has been found between hoarding intention and consumption and it is negatively related with nudge behavior. The three way interaction effect of overconsumption behavior, weight control orientation and healthy eating on nudge behavior of consumers is positive. In situations of overconsumption, high orientation towards weight control and healthy eating together contribute to high nudge behavior.

Keywords:[COVID-19, Risk perception, Hoarding, Overconsumption, Nudge behavior, Moderated Mediation]

Introduction

Pandemics are unusual phases in history that tend to recur with varying degrees of intensity and longevity (Huremovic, 2019). The imposition of lockdown restrictions altered customer shopping patterns, habits and lifestyles (Di Renzo, 2020; Jribi, 2020) because of an increased perception of fear and uncertainty (Sterman and Dogan, 2015; Marinkovic and Lazarevic, 2021; Nutley, 2021). The pandemic disrupted food supply chains and caused people to worry about the regular supply of food and other household essentials. Anticipation of shortages, movement restrictions and perception of high risk of COVID-19 infection led consumers to hoard food and groceries (Long and Khoi, 2020). Due to movement restrictions, people were either not working (as businesses were closed) or they worked from home and saved time spent on everyday travel. These factors contributed to increased time with individuals for self-enhancement or greater indulgence in family/household activities (Sheth, 2020). According to a report by Ernst and Young, a vast number of Indian consumers became increasingly health-conscious and indulged in proactive health maintenance. A rising trend was observed in the consumption of immunity boosters such as vitamins C and E, fruits, vegetables, olive oil, vitamin D, omega-3 fatty acids (Di Renzo, 2020; Laguna et al. 2020; Molina-Montes et al., 2021) and natural/organic/ayurvedic food (Guney and Sangun

2021; Kumar and Abdin, 2021). Lockdowns, travel restrictions, fear of stock-outs and risk of contracting the disease are some of the factors that stimulated stock-piling with the outbreak of the COVID-19 pandemic (Sheth, 2020; Tan, 2020; Taylor, 2020) and an increase in grocery spending was noticed (IRI W.T. Information Resources Inc., 2020; Lamy et al. 2022).

Thus, the present paper sheds light on the impact of stressful lockdowns on the hoarding and also address the impact of “in-home everything” on unplanned consumption that needs attention in the present scenario. Specifically, this paper aims to investigate the impact of COVID-19 risk perception on the hoarding behavior of people in India using the Theory of Planned Behavior. The current study further explores the relationship between food hoarding and overconsumption behavior of consumers with nudge behavior. Health-conscious people generally make small changes in their diet for getting weight loss benefits in the long term rather than radical physical exercises or stringent cut of calories (Hall et al, 2011; Bucher et al., 2016). Such behavior of reducing portion sizes of food and following healthy dietary patterns show their nudge behavior (Venema et al., 2020). Nudge behavior involves reducing portion sizes of food and following healthy dietary patterns (Venema et al., 2020). It is proposed that the propensity to nudge will vary according to extent of people’s awareness of healthy dietary habits. Thus, this study bridges the gap

by highlighting the antecedents (mediators) to hoarding behavior and also health protective outcomes. Thus, it makes a theoretical contribution to hoarding literature and identifies a possible way in which marketing and public policy efforts can be stimulated to protect consumer health even during situations of threat.

Literature Review

The present study investigates two models. In Model 1, the mediating role of attitude towards hoarding due to risk perception of a threat (pandemic) and hoarding intentions is examined. In Model 2, with hoarding and overconsumption as antecedents, the moderating roles of weight control and healthy eating orientation of consumers are investigated on health promoting dietary behavior outcomes (nudge).

Mediating role of attitude between risk perception and hoarding intentions (Model 1)

Consumers generally develop hoarding intentions in response to marketing promotions (Andani and Wahyono, 2018). But in unusual situations, stockpiling has also been noticed which is known as disaster-triggered stocking of goods (Mitchell Berger et al. 2019; Chen et al., 2020; Makwana and Dave, 2020; Pan et al., 2020; Keane and Neal, 2021; Micalizzi et al., 2021; Sherman et al., 2021) as consumers perceive threat, anxiety or stress (Baddeley, 2020; Wang et al. 2020). When people perceive environmental events negatively, they indulge in building defences by changing their own behavior (Bavel et al. 2020) such as overstocking in anticipation of risk (Long and Khoi, 2020). Besides the direct manifestations, it is important to uncover what happens to consumers who perceive the situation as risky? Risk to contract the disease is seen to modify the attitude of consumers toward buying (hoarding) food (Widayat and Arifin, 2020). Wang et al. (2020) confirm that fear of catching COVID-19 is an important determinant of food hoarding behavior. They also found that people in a bad psychological situations or those who feel that they face high risk of catching the disease hoard more. This suggests that previous research gauges the effect of risk perception on attitude to hoard and also the effect of risk perception on hoarding behavior. The linkage between risk perception, attitude toward hoarding and hoarding behavior has not been investigated. So, the present study draws from the theory of planned behavior (Kahlor et al. 2018) and proposes that the stimulus (pandemic in this case) modifies attitude of consumers toward hoarding which further triggers hoarding intention. This ra-

tionale behind proposing this relationship stems from our understanding of introduction of novel food (such as organic or functional food) in the marketplace which are purchased by consumers only after positive attitude build up. So it is reasonable to propose that hoarding intentions during the outbreak of novel virus will happen because a positive attitude to hoard will build up.

The following hypotheses have been proposed to check the relationships:

H₁: Risk perception builds a positive attitude towards hoarding.

H₂: Positive attitude towards hoarding positively effects hoarding intentions.

H₃: Attitude towards hoarding mediates the relationship between risk and hoarding intentions.

H₄: Weight control positively leads to nudge behavior

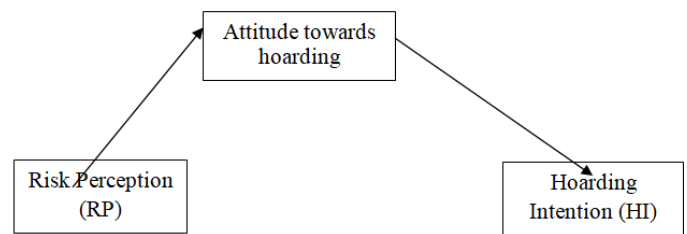
H₅: Weight control moderates the relationship between consumption and nudge behavior

H₆: Healthy eating positively leads to nudge behavior

H₇: Healthy eating moderates the relationship between consumption and nudge behavior

H₈: Mediating role of consumption between hoarding and nudge behavior is moderated by weight control and healthy eating

H₉: Interaction between consumption, weight control and healthy eating is positive



Model 1: Mediating role of attitude towards hoarding on hoarding intention

After proposing the impact of perceived risk and attitude changes on consumers' hoarding intentions, there is need to assess the possible outcomes of food hoarded by consumers (refer Model 2). Previous studies conclude that there is tendency amongst consumers to consume food more frequently when food are hoarded (Chandon and Wansink, 2002; Wansink, 2004). No doubt, overconsumption of stockpiled goods varies according to preparation time, convenience and price of the product but storing products in bulk quantity and at visible places, stimulates overconsumption (Emilien and Hollis, 2017). As consumption of excessive food than required

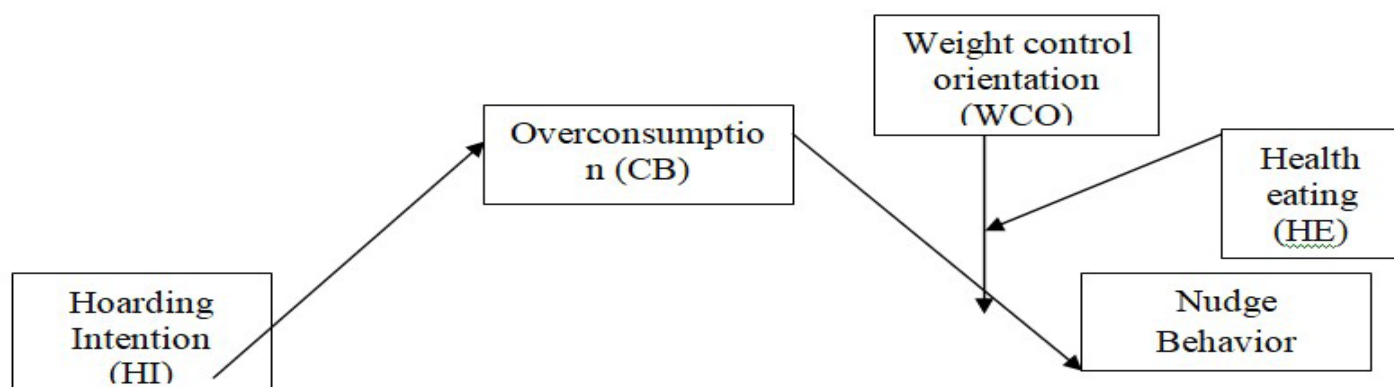
leads to weight gain and/or obesity (Di Renzo, 2020), it raises health concerns arising thereof. Undoubtedly, stockpiling products results in higher consumption but it subsequently starts declining because a saturation level of taste is reached (Wansink, 2004). So, the impact of hoarding behavior and overconsumption on nudge behavior is explained in the next section.

Moderating role of weight control and healthy eating on nudge behavior (Model 2)

Nudge theory is effectively used to measure small alter-

ations in people's eating behavior that lead to long term gains such as an increase in intake of fruit and vegetables (Thaler&Sunstein, 2008; Sharps, Thomas &Blissett 2020). Thereafter, motivation to healthy eating has been introduced as a moderator using the Protection Motivation theory.

Other factors like motivation for healthy eating (HE) and weight control orientation (WCO) may also contribute towards declining consumption.



Model 2: Moderation of weight control and healthy eating on mediating role of overconsumption between hoarding and nudge behavior

Research Methodology

Study Design

An online survey was conducted with respondents aged 18 years and above and sourced through the Google form. Information was sought from the respondents about their food shopping and consumption behavior as well as their practices to keep themselves healthy during the COVID-19 pandemic. All questions were compulsory in this survey. The survey was conducted between 11th May and 20th May 2020. During this pe-

riod, a complete lockdown was imposed in India and the number of infected people was rising rapidly.

Survey Participants

Data have been collected from 302 respondents from across states of India. The participation was voluntary and no incentive was given to them for filling online survey instrument. The demographic profile of sample is given in Table 1. SPSS 19.0 and PROCESS Macro v3.0 have been used to analyze the data.

Table 1: Sample Description

Demographic Characteristics		Frequency	Percentage
Age (in Years)	Less than or equal to 30	177	58.6
	30 and above	125	41.4
Gender	Male	117	38.7
	Female	185	61.3
Monthly Family Income (in INR)	Less than or equal to 100000	190	62.9
	100000-200000	71	23.5
	More than 200000	41	13.6
Education Status	Up to Graduate	73	24.2
	Post Graduate	154	51.0
	Doctorate and above	75	24.8

Source: Authors' calculations based on primary data

Subsequently, Table 2 depicts the measures used in the study.

Table 2: Description of Measures Used

Construct	Scale	Range	Reliability	Codes used
Risk Perception (RP)	Long and Khoi (2020)	1-5 SDA to SA	0.813	Aggregate score
Attitude (AT)	Long and Khoi (2020)	1-5 SDA to SA	0.899	Aggregate score
Intention to Hoard Food (HI)	Long and Khoi (2020)	1-5 SDA to SA	0.882	Aggregate score
Consumption Behavior (CB)	Van Strien et al. (2002)	1-5 SDA to SA	0.946	Aggregate score
Motivation for Health (MH)	Muturi et al. (2017)	1-5 SDA to SA	-	Aggregate score
Nudge Behavior	Venema et al. 2020	1-5 SDA to SA		Single Item

Source: Authors' calculations based on primary data

Results

Before testing serial mediation, all the constructs have been firstly validated through CFA using AMOS 18.0. The reliability and validity of all the constructs have been confirmed as per prescribed indices (Hair et al., 2010). Composite reliability (CR) and average variance extracted (AVE) are greater than 0.70 and 0.50 respectively. Convergent, discriminant and nomological validity have also been established. The proposed model gives a reasonable fit for indices such as CFI, TLI, GFI,

AGFI and RMSEA which fulfill the minimum criteria. This depicts that model is fit for estimating the proposed paths.

Mediation Analysis

The indirect impact of risk perception (X) on hoarding intention (Y) through attitude (M) (Model 1) has been tested using model 4 of PROCESS macro version 3.4 (Hayes, 2012). Results have been attained at 95.0 per cent level of confidence with 5000 bootstraps resamples.

Table 3: Mediating role of attitude between risk perception and hoarding intention (HI)

Variables	Attitude (Y)				Results
Panel A	Coefficient	SE	LCI	UCI	
Constant	1.12	0.17	0.78	1.46	
Risk	0.41	0.05	0.31	0.52	Sig. (H1)
Panel B	HI (Y)				
Constant	0.52	0.11	0.29	0.75	Sig.
Risk	0.05	0.04	-0.01	0.12	NS
Attitude	0.80	0.04	0.73	0.87	Sig.(H2)
Indirect effect of X on Y					
Risk Attitude HI	0.33	0.04	0.25	0.42	Sig.(H3)
R ² =0.68, F=310.84, P<0.0000					

Source: Authors' calculations based on primary data

Panel A from Table 3 shows that risk perception during the COVID period brings about a significant change in attitude of consumers (B=0.41, LCI=0.78, UCI=1.46). The significance of coefficient is established by absence of zero in the lower and upper confidence interval given by LCI and UCI. Similarly, Panel B shows that attitude has a significant positive effect on hoarding

intention given by B=0.80, LCI=0.04, BCI=0.87. However risk perception does not have a significant effect on hoarding intention. The model is statistically significant (F=310.84, P<0.0000) and explains 68.0 per cent variation in hoarding intention. The indirect effect of risk perception on hoarding intention through the mediating role of attitude is significant (B=0.33, LCI=0.25, BCI=0.42).

Table 4: Results of Conditional Process Analysis

Variables	CB (Y)				Results
Panel A	Coefficient	SE	LCI	UCI	
Constant	0.75	0.12	0.52	0.98	
Hoarding	0.69	0.04	0.60	0.77	Sig.
Panel B	Nudge (Y)				
Constant	-4.68	1.70	-8.03	-1.33	Sig.
HI	-0.43	0.08	-0.58	-0.02	Sig.
CB	3.72	0.66	2.42	5.03	Sig.
WCO	1.26	0.58	0.12	2.40	Sig. (H4)
CB*WCO	-0.49	0.22	-0.92	-0.05	Sig. (H5)
HE	1.13	0.48	0.18	2.07	Sig. (H6)
CB*HE	-0.50	0.18	-0.86	-0.14	Sig. (H7)
WCO*HE	-0.30	0.14	-0.58	-0.03	Sig. (H8)
CB*WCO*HE	0.13	0.05	0.02	0.23	Sig. (H9)
R2=0.8758, F=120.62, P<0.0000					
Conditional effects of the focal predictor at values of the moderator					
WCO	HE	SE	Coefficient	LCI	UCI
Low	Low	0.10	1.98	1.78	2.18
Low	Medium	0.13	1.81	1.56	2.07
Low	High	0.19	1.64	1.26	2.02
Medium	Low	0.15	1.84	1.55	2.13
Medium	Medium	0.09	1.87	1.69	2.04
Medium	High	0.10	1.90	1.71	2.09
High	Low	0.22	1.74	1.31	2.18
High	Medium	0.13	1.91	1.65	2.16
High	High	0.11	2.07	1.85	2.29
Index of moderated moderated mediation					
	Index	SE	LCI	UCI	
	0.09	0.02	0.03	0.14	
Indices of conditional moderated mediation					
HE	Index	SE	LCI	UCI	
Low	-0.06	0.04	-0.16	0.02	
Medium	0.02	0.04	-0.05	0.10	
High	0.11	0.05	0.01	0.21	

Source: Authors' calculations based on primary data

The second model (Model 2) investigates the indirect impact of stimulated consumption between hoarding intention and nudge behavior of consumers. Along with this, it analyses the moderated mediation impact (conditional impact) of stimulated consumption in the presence of two moderators. Weight control orientation (WC) has been used as the first moderator. The role of healthy eating (HE) has been examined for its impact on the first moderator (WC). Table IV describes the results

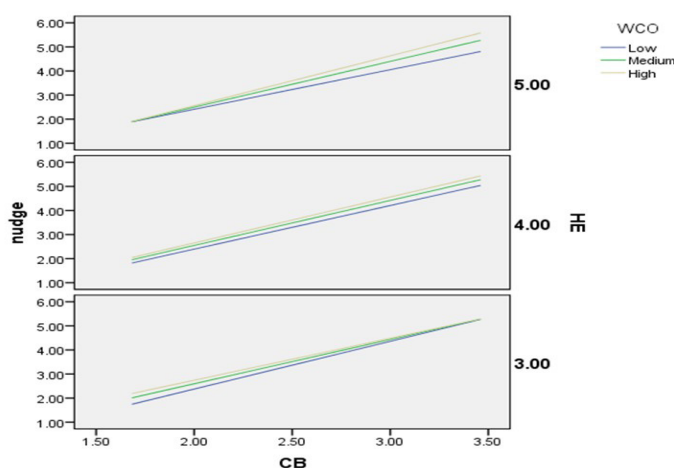
of this model.

Panel A suggests that hoarding intention positively increases consumption amongst consumers (B=0.45, LCI=0.60, BCI=0.77). Panel B shows that hoarding intention reduces the nudge behavior of consumers (B=-0.43, LCI=-0.58, BCI=-0.02). This is possible because when consumers hoard food they will not simultaneously think of consuming them in lesser proportions. Availability of food around people stimulates consumption

rather than limiting it. However, consumption stimulated by hoarding ($B=3.72$, $LCI=2.42$, $BCI=5.03$) and weight control orientation of consumers ($B=1.26$, $LCI=0.12$, $UCI=2.40$) positively initiate nudge. Interestingly, the interaction of stimulated consumption and weight control orientation ($CB*WCO$) reduces the nudge behavior of consumers. This suggests that although consumption and weight control orientation initiate nudge, yet, the joint impact of the two variables decreases nudge behavior of consumers. Similarly, healthy eating orientation has a positive impact on nudge behavior ($B=1.13$, $LCI=0.18$, $UCI=2.07$) but the interaction of CB and HE reduces nudge behavior of consumers ($B=-0.50$, $LCI=-0.86$, $UCI=-0.14$). The three-way interaction between CB, WCO and HE brings about positive impact on nudge behavior of consumers. The value of B is also significant as given by $LCI=0.02$ and $BCI=0.23$. The model is significant ($F=120.62$, $p<0.0000$) and explains 87.58 percent variation in nudge behavior of consumers. The table further shows the significance of the focal predictor (HI) on nudge behavior of consumers in the presence of the two moderators. Also called the conditional effects, these values depict the impact of hoarding intention on nudge behavior at three levels of each moderator (high, medium and low). The conditional impact of HI at all three levels of WCO and HE is significant as shown by absence of zero in the lower and upper confidence interval.

Index of moderated moderated mediation tests for the significance of the mediated path with WCO as the first moderator and HE as the second moderator. The index is significant as shown by $B=0.09$, $LCI=0.03$, $UCI=0.14$. However, indices of conditional moderated effects show that the impact of HE is significant only at high levels ($B=0.11$, $LCI=0.01$, $UCI=0.21$).

Figure I: Visualization of moderation impact



For consumers exhibiting low HE, nudge behavior rises along with rise in external cue-based consumption. At low levels of consumption, nudge is higher amongst consumers who hold higher WCO. With an increase in stimulated consumption, nudge behavior becomes similar for consumers holding varied levels of WCO. Consumers indulging in high HE follows higher nudge behavior as stimulated consumption rises for them. At low levels of cue-oriented consumption, they indulge in lower nudge (irrespective of their WCO). But as cue-oriented consumption rises, the nudge behavior of consumers having higher WCO is greater than consumers depicting lower WCO.

Discussion

The present study contributes to the scant literature investigating the impact of unusual phases in history on consumption behavior. It contributes to theory by elaborating on the impact of hoarding intentions, motivation to eat healthy food on consumer outcomes. The study depicts that risk perceptions alter attitude of consumers which leads to hoarding intentions in consumers lending support to recent findings of Long and Khoi (2020). Further, a significant direct positive relationship has been found between attitude of consumers and their intention to hoard groceries and other essential goods. These relationships show that due to lockdown restrictions, people were too much worried about the availability of food and other essential goods in required quantity. This finding corresponds with the findings of Long and Khoi (2020), Sheth (2020), Tan (2020) and Taylor (2020). Hence, this perception of consumers led them to shop for food and other household essentials more than required quantity. Similar findings have been observed by Nutley (2021). Risk perception and hoarding intention are also significantly related to each other but in an indirect way. This indicates that people do not stockpile food and essential goods due to perceived risk only. Attitude acts as a mediator between risk perception and hoarding intention. Therefore, when people perceive risk, their attitude changes and leads to hoarding intention.

In line with the findings of Chandon and Wansink (2002) and Wansink (2004), the results also reveal that hoarding intention is positively related with consumption. Whereas it is negatively related with nudge behavior of consumers. This may be so because if huge quantity of food are available at home, the propensity of consumption increases rather than decreases. However, consumers who want to control their weight and

believe in healthy eating also depict nudge behavior. Contrary to this, the interaction of consumption behavior and weight control orientation as well as interaction of consumption behavior and healthy eating also reduce nudge behavior of consumers. The three-way interaction effect of overconsumption behavior, weight control orientation and healthy eating on nudge behavior of consumers is positive. It is seen that weight control orientation of consumers has a strong effect on nudge behavior of consumers. Consumers exhibiting high weight control orientation depict higher nudge behavior when they are also personally highly inclined towards healthy eating. In situations of overconsumption, high orientation towards weight control and healthy eating together contribute to high nudge behavior. This implies that marketers should communicate healthfulness of food and their contribution to weight control and management to target nudge-oriented consumers.

Conclusions

The risk of COVID-19 infection is a strong predictor in shaping the eating preferences of people. During this phase, people were worried about the regular supply of food and other household essentials in anticipation of their shortage in near future. Hence, people who felt more risk from COVID-19 infection had started hoarding food and other grocery items in anticipation of stockouts and movement restrictions. Customers who perceived a high level of threat of infection from COVID-19 bought more quantity of grocery items than others who perceived a low level of risk from COVID-19 infection. The study depicts that the threat of risk perception transforms the attitude of customers towards the hoarding of food. More so, the stockpiling of food is an important factor that leads to overconsumption. Thus, the present study further explores the relationship between food hoarding and consumption behavior of people. Moreover, people's consciousness for healthy dietary habits also acts as motivation in consuming healthy food and maintaining dietary balance. Health-conscious people generally make small changes in their diet to reduce their weight. Such behavior of reducing portion sizes of food shows their nudge behavior. Thus, this study bridges the gap by highlighting important issues related to the COVID-19 pandemic such as how the threat of risk perception changes the attitude of customers towards food consumption behavior. The study shows that although stockpiling leads to over-consumption, health-conscious consumers follow nudge behavior and focus on healthy food, and their

dietary patterns are moderated by weight control activities.

Limitations and Directions for Future Research

The responses have been collected through an online survey due to lockdown restrictions. Hence, data have not been collected from those persons who do not use internet or who are not internet-savvy. The study is limited in scope as the respondents were 18 years old or above. Thus, the study does not cover responses of people who are less than 18 years of age. The present study is conducted to investigate the consumption behavior of people during the first lockdown of the COVID-19 pandemic. Future research can be done to investigate the post-covid effect on the food consumption behavior of consumers.

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