

Review Article

Corona virus: the Paradox between Food Insecurity and Weight Gain

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Abstract: Communicable diseases are emerging globally at an unprecedented rate and affect all life aspects. Novel coronavirus spread all over the world and affects all health and economic parameters and food is not an exception. During the past years, prevalence of food insecurity and weight gain becomes results of infectious diseases. This interaction has not been generalised in all communities, because findings differ based on household income, race/ethnicity, sex and age. Several hypotheses try to explain the association between food insecurity and weight gain and communicable diseases especially in stressed circumstances such as outbreak of Covid- 19. This review tries to provide a conceptual proposal linking weight gain, food insecurity and outbreak of Covid- 19. This link will help to make welfare reform, policy changes, and poverty prevention and reduce negative health impact of weight and obesity.

Keywords: Covid, Corona virus, Food, Insecurity, Weight, Obesity.

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INTRODUCTION

It seems that Corona virus outbreak will paradoxically associated with weight gain and food insecurity worldwide. Current paper tries to hypothesises two directions to explain this expected phenomenon. There is expected food insecurity due to the work closure as a result of Corona virus outbreak and expected weight gain due to population's long time home stay, dietary intake and physical inactivity habits. Furthermore, Low food security and obesity are associated with diseases outbreak because of the limited knowledge, and resources (Cluver, L. *et al.*, 2020; Wang, G. *et al.*, 2020; Rohr, J. R. *et al.*, 2019; Webster, D. 2001; & Yanovski, J. A. *et al.*, 2000).

Social stress of communicable spreading diseases may be associated with low energy expenditure and metabolic efficiency. Since low food security tends to be associated with low social status stability, the role of social stability in determining metabolic efficiency may contribute to the development of obesity in the circumstances of Covid-19 outbreak. Both animal and human studies suggest that low social status organisms may be less metabolically efficient (Yanovski, J. A. *et al.*, 2000).

Social instability may also influence diet preference and dietary intake in humans. Discontinuous

of education, employment, and income are associated with poor diet quality that is high in energy density. There is also evidence that low food security is associated with a weight gain response in the presence of high calorie, energy dense foods in humans. Longitudinal studies have proven that relative food insecure or food insecure without hunger is associated with greater weight gain. The findings also suggest that increased energy intake may be a fundamental response to threats to food security that is persistent independent of the actual food supply, in low or instable social status. Weight gain may be a fast and strategic response to combat low food security to ensure survival and this may be the case with communities during Covid- 19 outbreak. Cortisol metabolism may regulate weight gain in response to food insecurity in social instable circumstances. Higher basal cortisol levels are associated with Low social status. Impaired cortisol is hypothesized to be an indicator of cumulative exposure to stress. This article will discuss two poles of business interruption during a Covid 19 outbreak and the expected effects on weight gain and food insecurity (Hull, H. R. *et al.*, 2006; Boutelle, K. N. *et al.*, 1999; & Ma, Y. *et al.*, 2006).

METHODOLOGY

Searching on the internet using the Google scholar search engine, and scientific databases was the

main source of data. The keywords include covid, corona virus, food, insecurity, weight, and obesity. The search has generated about 362 sources, of which 27 sources have actually used. These 27 articles were considered relevant because they answered the aim and objective of the review. All included articles were written in English.

Corona virus Life Style, Obesity, and Physical Activity

In response to the COVID-19 outbreak, the governments have ordered a nationwide schools and works closure and public activities are discouraged as emergency measurements to prevent spreading of the corona virus infection. United Nations International Children's Emergency (UNICEF) estimates that there is a nationwide school closures disrupt the education for more than 80 per cent of students worldwide (Cluver, L. *et al.*, 2020). Although these efforts and measurements are highly necessary and commendable, there are justifications to be concerned because prolonged home confinement and school closure during the COVID-19 outbreak might have negative effects on workers as well as students' nutritional, physical and mental health. Evidence suggests that when students are out of schools such as in weekends and summer holidays, they have much longer screen time; they are physically less active, they have less favourable diets, and irregular sleep patterns, resulting in a loss of cardio-respiratory fitness and weight gain. Such negative effects on health are likely to be much worse when students are confined to their homes without interaction with same aged friends and outdoor activities during the outbreak of diseases (Wang, G. *et al.*, 2020).

The holiday season is a time of the year suggested to present an increased risk of weight gain and obesity development. This is postulated to be caused by stress associated with the holidays, increased caloric intake, and/or a decline in physical activity. There is little available evidence to identify whether annual body weight increases are the resultant effect of the perceived continual daily discrepancy in energy balance or are due to more discrete periods of weight gain such as holiday periods (Rohr, J. R. *et al.*, 2019; & Webster, D. 2001). Although a great deal of publicity is given to holiday weight gain, few research studies have been done to examine weight changes during the holiday season. Only one research study was performed in college students (Yanovski, J. A. *et al.*, 2000). Hull *et al.*, stated that an increase in body weight was observed over the holiday with males and females exhibiting similar trends (0.6 kg and 0.4 kg, respectively), however, the greatest increases in body weight were witnessed in graduate students (0.8 kg) and overweight/obese participants (1.0 kg) (Hull, H. R. *et al.*, 2006). Yanovski *et al.*, studied 195 adults and found the holiday season resulted in a significant ($P < 0.001$) increase in body weight of 0.37 kg (Yanovski, J. A. *et al.*, 2000). The holiday season is a time when

cultural and social influences combine to create a high risk environment conducive to weight gain and this is the case of the long schools and works closure during Covid-19 outbreak. A number of factors particularly prevalent during the holiday celebrations that encourage over consumption include: longer eating durations, easy access to food, eating in the presence of others and increase portion sizes (Yanovski, J. A. *et al.*, 2000; & Boutelle, K. N. *et al.*, 1999). Further, Boutelle (1999) reported that both their intervention and comparison groups found it difficult to effectively manage their weight during the holiday period (Boutelle, K. N. *et al.*, 1999).

In 2000, Yanovski *et al.*, examined body weight change in 195 adults before, during, and after the winter holiday season. Compared with body weight in late-September/early-October (preholiday), students and/or workers. During less-structured days – where there may be less regulation and restriction – students and workers may be exposed to increased unsupervised and open-ended periods of time where they are free to indulge in sedentary activities, such as television viewing and playing computer games (Yanovski, J. A. *et al.*, 2000). During the school/ work day, students and workers have limited opportunities to eat/drink and access to regulated food programs that provide nutrient dense meals that meet existing nutrition guidelines. Conversely, less-structured days may be giving workers and students increased opportunities to snack and access to unhealthier foods in the home (Ma, Y. *et al.*, 2006). Obesity has been associated with immune dysfunction. In addition, obese individuals have a low level of circulating Tumour Necrosis Factor α “TNF- α ” and Interleukin “IL-“, suggesting a state of chronic inflammation. Interestingly, obesity is also associated with chronic pulmonary and cardiovascular diseases (Poulain, M. *et al.*, 2006; & Poirier, P. *et al.*, 2006). All these factors make weight gain and obesity during Covid-19 outbreak a significant indicator for public health intervention. In Boutelle *et al.*, study, participants had a significant average net body weight gain (0.5 ± 2.2 kg) in late February/early-March (after the holiday). Interestingly, $>75\%$ of the net body weight gain (0.4 ± 1.5 kg) occurred during the holiday period (Boutelle, K. N. *et al.*, 1999). However, and on the other hand, Reid and Hackett examined the effect of holiday on body weight and found a non-significant increase in body weight. Possible limitations of the Reid study included the enrollment of only 26 subjects, with five subjects reported being ill (Reid, R., & Hackett, A. F. 1999). Thus, identifying workers and students' obesogenic behaviours during a less-structured day (holiday day) and comparing this in relation to a structured day (school / work day) might shed light on what occurs over the COVID- 19 outbreak. Structured Days Hypothesis' (SDH) which is represented herein by a school/ work day, it is hypothesized that the consistent presence of structure, routine, and/or regulation within a day positively shapes

the obesogenic behaviours of students and workers and minimise intake of unhealthy meal. The current situation during outbreak of Covid-19 seems to be people have less structured days. This outbreak may lead to more irregular sleeping hours, irregular meals time, high fat and carbohydrates access and less physical activity (Wansink, B. 2004; Brazendale, K. *et al.*, 2017; Pinstrop-Andersen, P., & Shimokawa, S. 2008; & Franckle, R. *et al.*, 2014). All these factors may accelerate the weight gain phenomena during outbreak of Covid-19.

Impact of Covid-19 on Food Security

Infectious diseases are emerging globally at an unprecedented rate while global food demand is projected to increase sharply by 2100. Agricultural development can yield direct improvements to nutrition, and through several mechanisms, nutrition can be a critical determinant of infectious disease susceptibility and progression. By improving nutrition, agricultural development should facilitate combating many infectious diseases. For example, death rates from acute respiratory infections, diarrhea, malaria and measles, diseases that on average kill more than a child every 30 seconds (1 million per year), are much higher in children who suffer under-nutrition than in those that do not. (Yamano, T., & Jayne, T. S. 2004; & Olivero, J. *et al.*, 2020) Economic development, especially agricultural development, has historically driven reductions in infectious diseases, food insecurity and poverty across many settings. In fact, the poor financially benefit more from economic growth in the agricultural sector than in industrial or service sectors. In rural subsistence communities, any source of ill health can significantly impact people's productivity, yields and agricultural output. For example, human immunodeficiency virus/AIDS has reduced average life expectancy in sub-Saharan Africa by 5 years since 1997, and a Kenyan study found that crop production by rural subsistence-farming families dropped 57% after the death of a male head of household (Peeters, A. 2018; & World Bank Group. 2015).

As businesses shutter and unemployment surges, food banks around the world anticipate tens of thousands of additional people may begin relying on them for meals. Across the world, poor and unemployed communities watch and wait for the collision of multiple crises: the widespread onset of the COVID-19 disease and household money and food supplies running out. At an international level, the Committee on World Food Security has reported that the crisis is already affecting the food system directly through impacts on supply and demand with unknown impacts on medium- and long-term food supply (Himelein, K., & Kastelic, J. G. 2015).

A 2019 review of the scientific literature has found that since 1940, agricultural drivers were associated with more than 50% of infectious diseases

caused by germs that spread between animals and people. These percentages are anticipated to increase along with human population growth and the further expansion and intensification of agriculture (Rohr, J. R. *et al.*, 2019). An incomplete list of deadly pathogens recently emerging from agriculture include H5N1-Asian Avian Influenza, H5N2, multiple Swine Flu variants (H1N1, H1N2), Ebola, *Campylobacter*, Nipah virus, Q fever, hepatitis E, *Salmonella enteritidis*, foot-and-mouth disease, and a variety of other influenzas including the novel Corona virus that is now wreaking havoc. These types of pathogen outbreaks are occurring at an increased frequency globally while representing a large fraction of total "hidden" costs imposed on humanity and the environment by the modern food system (Himelein, K., & Kastelic, J. G. 2015). The food system is also an important social determinant of public health, with low-quality diets often consumed by poor communities being a significant factor in the substantial rise of diet-related chronic diseases globally during outbreak of communicable diseases. (Rohr, J. R. *et al.*, 2019; & World Bank Group. 2014).

The short-term health effects of missed meals during pandemic related food insecurity include fatigue and reduced immune response, which increase the risk of contracting communicable diseases. Even brief periods of food insecurity can cause long-term developmental, psychological, physical, and emotional harms. Children from low-income households, who are already at higher risk for poorer health and academic performance than children from high-income households, may be further disadvantaged by nutrition shortfalls during outbreaks of diseases (World Bank Group. 2014). In Sierra Leone, there were an estimated 9000 job losses among wage workers and 170,000 self-employed workers were no longer working in July/August 2014 during Ebola virus outbreak and the case will be very similar during Covid-19 outbreak. Half of those who previously workings in Liberia before the Ebola virus outbreak were no longer working, with the self-employed hardest hit mainly due to closure of markets. (World Bank Group. 2015; & Himelein, K., & Kastelic, J. G. 2015; & World Bank Group. 2014)

The United Nations Development Programme estimated that after four months the Corona virus outbreak there has been a substantial drop in household income of 30% -35% in many countries. The Covid-19 outbreak led to food shortages and increases in food prices. The World Food Programme estimated that by November 2020 an additional 200,000 people had become food insecure as a direct result of the Covid-19 outbreak and that figure would rise to between 750,000 and 2.3 million by March 2021 if the outbreak continuous. It is likely that pregnant and breastfeeding mothers, newborns and young children may have been most adversely affected with potential for long term food insecurity consequences (Miles, A. 2020; & Dunn, C. G. *et al.*, 2020).

On production side, with restaurants, schools, caterers, corporate cafeterias, and some farmers markets shutting down, farmers also have fewer outlets for their highly perishable produce, exacerbating a supply bulge and this is a sort of food insecurity. On the demand side, a loss of purchasing power caused by the disease could change people's eating patterns, resulting in poorer nutrition. Panic purchases of food — as those recently witnessed in countries around the world — could break the supply chain and cause localized price hikes and this is another sort of food insecurity (Dunn, C. G. *et al.*, 2020; & Geoffrion, A. M., & Graves, G. W. 1974). Apart from the food security implications of a COVID-19-triggered economic slowdown, an extensive spread of the disease in a poorer and more food insecure country could take a heavier toll on the economy than in those currently affected. Countries with high levels of food insecurity are generally more vulnerable and less prepared for an epidemic outbreak and would likely see higher mortality rates. The resulting larger hit to the workforce in more food insecure, lower-income countries would coincide with often more labour-intensive production, aggravating the repercussions on output. At the same time, service industries in poorer countries are often less digitized and more reliant on face-to-face contact, meaning that containment measures, designed to limit human interaction, or avoidance by scared customers could hit harder (Flahault, A. *et al.*, 2006). In some contexts, the economic consequences of COVID-19 could end up hurting more people than the disease itself. For them triggered global economic recession will mean a lot more expensive imports and a lot less money through exports. This equation is the most negative form of food insecurity especially in developing countries (Anderson, R. M. *et al.*, 2020; & McKibbin, W. J., & Fernando, R. 2020).

CONCLUSION

The outbreak of coronavirus has disrupted many countries' agriculture, economy and health systems. The evolution of the disease and its health and economic impact is highly uncertain which makes it difficult for policymakers to formulate an appropriate policy response toward COVID-19 outbreak. In order to better understand possible nutritional outcomes, this paper explores two different scenarios of how COVID-19 might evolve in the nutritional status of the societies. These scenarios demonstrate the scale of weight gain and food insecurity that may happen as a result of COVID-19 outbreak.

Consent

It is not applicable.

Ethical approval

As per international standard or university standard, written approval of

Competing Interests

Authors have declared that no competing interests exist.

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