Research Journal of Economic and Management Studies (RJEMS). Vol. 2, No. 2, (2022), ISSN: 2789-6803 (Online). 2789-678X (Print). Great Zimbabwe University, School of Commerce based Journal

Wellbeing, Obesity and Overweight Matrix: Exercise Medicine as Preventive Remedy to COVID-19 Risk Infections among Adults in Masvingo Urban, Zimbabwe

[1]Prince Chimonero* and [2]Rabson Wuriga
[1]Physical Education Department, Great Zimbabwe University
[2]Department of Philosophy & Religious Studies, Great Zimbabwe University
[1]pchimonero@gzu.ac.zw; pchimonero@gmail.com
[2]rwuriga@gzu.ac.zw; rwuriga@gmail.com
*Corresponding author

Abstract
Globally, obesity and COVID-19 scourge are life-threatening risks to human existence and well-being with a heavy bearing to human capital and resources. Epidemiologic breadth of these cormobidities subsequently contributes to high mortality rates. This study explored the extent to which obesity and overweight cormobidities are connected with coronavirus infections. It was conducted with the view to recommend exercise medicine as a non-pharmacological preventive measure to this viral infection. This cross-sectional study adopted a quantitative approach that was informed by a positivist research philosophy. It was conducted in Masvingo urban among male and female participants with obese and overweight conditions. The study population was 120 from which 40 participants (35 years+) were drawn. In drawing up this sample size stratified random sampling was adopted with Taro Yamani's (1970) formula used to determine a convenient size for the study. Bowley's proportional allocation formula statistically distributed participants into their particular strata. WHO s' Global Physical Activity questionnaire was adopted and used to collect data that was presented on tables. Emerging findings revealed that overweight and obesity cormobidities were connected with high risks of COVID-19 infections with subsequent high mortality rates. Sedentary lifestyles highly contributed to the development of obesity and overweight tendencies. The study recommends that obese persons engage in aerobic and anaerobic physical training in order to trim down risks associated with COVID-19 infections. Adults need to be actively involved in HIIT of moderate to vigorous intensities for at least five times a week to develop cardiovascular fitness (CVF) and reduce burden of health-care costs. This could significantly reduce angiotensin levels, blood viral spikes and excess intramuscular ectopic fat deposits, a prime target of COVID-19 infection. This capacitates enzyme activation potentiating catalytic energy catabolism promoting efficient arterial routes and strong immunity. Anthropometric body tests are necessary to clinically ascertain Lean Body Mass and normal Body Mass Indexes.

Keywords: *Body Mass Index, Cardiovascular, Coronavirus, Exercise and Obesity.*

1. Introduction

The condition of obesity is an impediment to well-being. Global attempts have focused on providing rescue basis from COVID-19 scourge towards sustainable industrial and economic boom. Existence of a physically healthy human resource base can only be the possible benchmark for any nation's economy to blossom. This paper attempts to critically look at how well-being conditions of obesity can pre-dispose people to COVID-19 risks. It calls for obese persons to take a serious reflection on the art of living that includes a rational self-mastery of the body through

avoidance of sedentary lifestyles towards more of developing habitual exercise and training. Since COVID-19 appear to be taking a toll on individuals with obesity and overweight disorders, this paper advances the argument that such risk factors are modifiable. Hence exercise routines could provide interventional bases in the reduction of COVID-19 mortality rates encouraging health living. Subsequently, the paper determines the extent to which obesity and overweight cormobidities are interlinked with corona virus risks and infections. Finally, the paper attempts to add to the empirical knowledge base in the field of health and exercise science for establishment of a robust and physically active population.

2. Problem statement

2.1 The Problem and its setting

Obesity has invariably turned into a global pandemic threatening human health (Wang *et al.,* 2020). Human health is part of well-being. When it happens that humankind does not attain maximum health levels, including defeating global pandemics like COVID 19, then the achievement of well-being is hindered. The issue of obesity has exponentially grown in importance in the light of recent increased mortality risk of SARS-CoV-2 (Kwok, *et al.,* 2020; Kassir, 2020) particularly those with obesity-oriented cormobidities (Stefan et al., 2020). Considerably this makes obesity a unifying risk factor for severe COVID-19. Recent developments in the field of virology and disease epidemiology have led to renewed interests in the general public health problem of obesity and COVID-19 risks which apparently have become unprecedented global burden of diseases with high transience rates (Wang *et al.,* 2020; Watanabe *et al.,* 2020). Global statistics show that 39% of adults are overweight (obese) (WHO, 2020) with those having over 40 kg/m2 Body Mass Indexes (BMI) to be at great risk of hospitalisation and mortality than those in the normal weight category (18.5-24.9 kg/m2). For instance, Western countries confirm that about 40% adults are obese while 32% are overweight in the United States (Fryar *et al.,* 2018). This has amplified COVID-19 risks and mortality rates with undue stress on health-care systems, decline in economic viability of recreational sport, trade and commerce industries and professionals alike. It is on this basis that this article explored related implications for susceptibility to COVID-19 risks for obese and overweight individuals in sport and exercise settings. Further, suggested exercise medicine measures could significantly trim down obesity-related cormobidities and COVID-19 risks for sporting and non-sporting individuals to establish their comfort zones in their related fields of operation.

2.2 Statement of the problem

The issues of obesity have a long standing history. Despite the availability of noteworthy measures to subdue these modifiable risk factors, the emergence and lethality of COVID-19 turmoil have further exacerbated an unparalleled rise in mortality rates among obese individuals. Entrenched in these foggy trends, sports clinicians and researchers alike should enticingly provide novel rescue basis that help abate the effects of coronavirus pandemic in the general population. Hence this study provided insights into how obesity-overweight matrix could become volatile grounds for high risks of COVID-19 (SARS-CoV-2) with subsequent rise in mortality rates.

2.3 Research questions

1. To what extent are obesity and overweight associated with coronavirus infections?
2. How can obesity and overweight conditions be abated to reduce COVID-19 infection risks?

3. Obesity and Overweight: A critical literature review

This section of the paper provides the empirical review of literature related to the topic clued by research questions that guided the study.

3.1 The concepts of obesity and overweight

The concepts of obesity and overweight are often interchangeably used though some differences exist. Stefan *et al.*, (2020) have popularised the term 'obesity' to describe a condition of excess body fat that represents the state of low-grade chronic inflammation and impaired immunity associated with multiple debilitating and life-threatening disorders. Obesity embodies a multiple of concepts often manifesting through respiratory dysfunctions, cardiovascular disease, diabetes, cancers, metabolic risks and related co-morbidities (Stefan *et al.*, 2020). More often than not, the condition leads to excess overweight (basal weight) causing musculoskeletal and joint pains from high stress placed on weight bearing structures. This serious health burden is connected with tissue re-modeling, high physical inactivity tendencies with limited energy outflow (Carbone et al., 2019) and metabolic syndrome (O'Hearn *et al.*, 2021; Kassir, 2020; Zhou *et al.*, 2020). For instance, Oguoma *et al.* (2021) revealed presence of a high burden of overweight and obesity conditions of between 91%-98% among Kuwait population. Subsequently these unpalatable circumstances could provide pathways to severe COVID-19 infections leading to surge in mortality rates. Hence obesity has considerably emerged among the principal global topical issues in public health research.

3.2 Obesity viaducts for coronavirus (SARS CoV-2)

Large and growing bodies of literature exist to demonstrate obesity as a risk factor to SARS CoV-2 (Guan *et al.*, 2020; Verga *et al.*, 2020). From a cardiological view point, individuals with high adiposity levels (excess fat mass) are most likely to develop elevated ectopic adipocyte in the alveoli space (Jia *et al.*, 2020). This has been found to have direct implications to high viral infection and inflammatory infiltration consequently leading to interstitial edema (Watanabe *et al.*, 2020). If taken from bodily physiochemical processes, angiotensin converting enzyme 2 (ACE2) has been linked with high affinity levels to COVID-19. Considerably, this makes it the putative receptor for COVID-19 invasion in lung epithelial and host cells (Zhou *et al.*, 2020). Substantial amounts of ACE2 are believed to be located in lungs, cardiovascular system, kidneys, gut, bladder and brain (Xiao *et al.*, 2020; Zhou *et al.*, 2020) suggesting high susceptibility grounds to COVID-19. This is due to ACE2's high receptivity to SARS-CoV-2. More so high fatty deposits in obese persons is the prime target of COVID-19 with regards to elevated levels of ACR2 (Jia *et al.*, 2020). Consequently, obese persons become more vulnerable to debilitating effects of COVID-19.

Excess body fat mass has been reported to impair cardiovascular, respiratory, metabolic and thrombotic routes **(**Blokhin and Lentz, 2013). These challenges have been found to reduce cardiorespiratory reserve and ability to cope with COVID-19 infection and immune functional processes (Sattar, McLinnes and McMurray, 2020). This makes obese persons more prone to cardiorenary challenges, early development of cardiovascular disorders, arterial fibrillation and diabetes (Stefan *et al.*, 2020). Of note, obesity and overweight can be linked with substantial metabolic concerns. The presence of diabetes and high adipose tissues can weaken insulin resistance reducing B cell function with implications on functional capacities of the immune system. In addition, COVID-19 may subdue pancreatic functions leading to severe damage of the lymphatic system causing death (Sattar *et al.*, 2020).

Obesity enhances thrombosis from blood clots lodged in the damaged arteries and veins from the effects of COVID-19 (Varga *et al.,* 2020). Further, the presence of COVID-19 viral spike in obese persons substantially affects lung functional capacities leading to forced vital capacity during inhalation and exhalation processes (Cui *et al.,* 2020). This prejudice cardiopulmonary processes and cardiac pumping efficiency from reduced Stroke Volume (Madjid *et al.,* 2020). This could suggest why obese persons' cardiorespiratory organs could become much stressed even with the slightest workload from vasoconstricted coronary and lymphatic routes (arteriosclerotic disorders). While severe obesity increases the risk of Acute Respiratory Deficiency Syndrome (Centres for Disease Control and Prevention, 2019) with similar reasoning, obesity has highly transmissible capacities. For instance, obese/overweight individuals who exhibit symptomatic aspects of influenza A have been reported to have greater viral shedding suggesting high vulnerability levels to COVID-19 invasions. Milner *et al.,* (2015) further observed that 42% of obese adults have longer viral shedding than adults who are not obese suggesting high risks to multiple respiratory infections. While adults above 70 years and obese individuals have less cardiorespiratory reserve that subjugates them to COVID-19 infection, it can be hypothesised that links with high BMI prompts high risks of COVID-19 in relation to physical redundancy levels. Hence obese persons with manifold cardio-metabolic ailments are at high risk of SARS-CoV-2 infections (Zhou *et al.,* 2020).

In a study among Kuwait adults (18-89 years) Oguoma *et al.* (2021) reported high prevalence rates of obesity and overweight for the 18-29 age range. Overweight was greater in men (43.5%) than was reported for women (35.9%). Inversely, obesity was greater among women (90.5%) than men (62.9%). This may suggest high calorie intakes in women that could have contributed to high prevalence of obesity compared to men. On the other hand this could pre-dispose them to coronavirus infections given that high adipose tissue levels are a putative receptor of COVID-19 from high angiotensin (ACE2) amounts (Jia *et al.,* 2020).

4. Empirical studies

Evidence exists to support the association between obesity and coronavirus disease. From a medical mechanist viewpoint, 40% of hospitalised cases are obese with resemblance of COVID-19 signs of respiratory irregularities (Richardson *et al.,* 2020). Abdominal obesity is associated with low-grade inflammation which potentiates modification of the immune response to COVID-19. Kassir (2020) established the immune system to be a critical biomarker of COVID-19 pathogenesis through its role in obesity-induced adipose tissue inflammation that potentiates metabolic dysfunctions, insulin resistance and hypertensive irregularities. In a related retrospective study of 433 hospitalized COVID-19 cases at Amiens University Hospital, France, Al-Salameh *et al.* (2020) indicated that 37.7% of the casualties were obese while 27.5% were overweight. In the same vein, O'Hearn *et al.'s* (2021) study further substantiated that a number of admitted COVID-19 hospital cases had cardio-metabolic complications linked to obesity. Farzanegan and Hofman (2020) in their analysis of COVID-19 fatalities found out that 65.04% of reported American deaths had great links with obesity. This burden associates obesity conditions with high risks of coronavirus infections and increased mortality rates.

Body Mass Index also has a critical role in potentiating risks of COVID-19. Cai *et al.*'s (2021) retrospective cohort study of 268 patients in Huwan, China, revealed that high BMI greater than

24kg/m^2 especially those with elevated cardiorespiratory challenges were vulnerable to COVID-19. From the study, 41% of the coronavirus cases were overweight/ obese suggesting high vulnerability to index cardiorespiratory cormobidities and dysfunctions. Movahed *et al.* (2019) authenticated thromboembolic risks to be high among obese patients than the non-obese class. These symptomatic risks further substantiate the lethality of coronavirus on cardiovascular organs.

Guan*et al.'s* (2020) national analysis study of 1590 admitted hospital cases diagnosed of COVID-19 in China, reported 24%-57% prior cormobidities linked to coronavirus risk. In a comparative study Grassley *et al.* (2020) reported 68%-72% severe cases that were admitted in Intensive Care Units (ICU). In both studies obesity emerged as a defining attribute. Increase in weight is believed to correlate with 32% increase in obstructive sleep apnea syndrome in obese persons. This evidence suggests high vulnerability levels obese persons are further entrenched in to symptomatic risks of coronavirus (Perppard *et al.*, 2000). Consequently, a substantial number of COVID-19 risk factors have their routes linked to overweight and obese conditions.

4.1 Exercise as preventive medicine to coronavirus (SARS-CoV-2) infection

Exercise medicine plays a significant role in weight loss and reduction of obesity. Progressive training methods of moderate to high intensities can substantially reduce the effects of obesity-oriented metabolic cormobidities of diabetes, hypertension, insulin resistance and inflammation (Ammori *et al.*, 2020). Regular exercise reduces high fat mass levels (atherosclerosis) paving way for increased cardiovascular fitness during cardiopulmonary workouts and daily musculoskeletal demands (Wang *et al.*, 2020). Further, physical exercise creates strong immune system able to suppress symptomatic presentations of COVID-19. This improves arterial and venous blood flow promoting cardiac pumping efficiency (Stroke Volume). Through constant physical exercise excess ectopic fat tissues which are the prime target of COVID-19 are reduced to normal levels (Lean Body Weight) making people re-discover their comfort zones. Exercises accelerate breakdown of intramuscular adipose tissue allowing for oxidation of fatty acids. This capacitates enzyme activation potentiating catalytic energy catabolism routes (Moinuddin *et al.*, 2012). With similar reasoning, angiotensin concentration levels in cardiovascular organs could be compacted allowing for development of strong immune systems.

Aerobic engagements have been reported to significantly reduce weight and effects of obesity. Physical exercise improves trafficking of oxygen energy enhancing elements (magnesium, calcium) to working muscles during moderate to vigorous activities with ultimate improvement of the cardiovascular fitness component (CVF) (Church *et al.*, 2007). This develops fit blood with high affinity to oxygen allowing for efficient alveoli processes to occur. As avowed by Ross *et al.* (2015), moderate intensity workouts of 30 minutes/day in a week have been shown to increase Cardio-Respiratory-Function by 9.4% while 60 minutes/day at the same intensity and duration increased CRF by 15.6%. Such regimes could be done in relation to one's physiological capacities to allow for gradual adaptations of health and fitness-related tenets. Wang*et al.* (2020) reiterate on multiple health benefits associated with exercise (boosting of mitochondrial reserves) as a measure of reducing risks of COVID-19 infections. Thus, obese and overweight individuals should refrain from the effects of sedentary habits and engage in self or expert-monitored regimes (non-pharmalogical workouts) to prevent metabolic derangement. World Health Organisation's (2019) global visionary plan on physical activity for 2018-2030 encourages that adults enhance their

fitness capacities through moderate to vigorous workouts for 30-60 minutes at least 5 days in a week. This assists in achieving clinically significant weight loss (Swift *et al.,* 2018).

A blend of aerobic and anaerobic High Intensity Interval Training (HIIT) routines could lead to weight loss. For instance, 4x4 minutes interval with 3 minutes recovery, 5x3 minutes (3 minutes recovery) can be implemented at anaerobic level while 10 minutes continuous running may constitute aerobic fitness training (Karlsen *et al.,*2017). Further, a combination of Resistance Training (RT) and Aerobic Training (AT) have been reported to decrease subcutaneous abdominal fat, increase in Lean Body Weight with positive weight control and overall health shape (Slentz *et al.,* 2011). The above training modes have multi-systemic benefits for overall health development.

Moderate-intensity routines improve the immune system, antioxidant defences and ant-inflammatory responses to coronavirus effects. They have been recognised as adjuvant therapy for mild-to-moderate COVD-19 effects (Shamsi and Shalamzari, 2020). This capacitates haemostatic processes through modification of coagulation and fibrinolytic responses (Pitsavos *et al.,* 2005). Furthermore, sedentary lifestyles can significantly contribute to coagulopathy, a predictor of mortality risk in COVID-19-stricken persons (Zadoo *et al.,* 2020). Hence exercise medicine need to be a life-long preventive therapy to coronavirus invasions.

5. Methodology

This section presents the methodology that guided the study.

5.1 Research design

A cross-sectional study was conducted among people with obese and overweight conditions in Masvingo urban.

Population and sampling

The study population was 120 from which a sample of 40 male and female residents (30 years+) in Masvingo urban was drawn. In drawing up the sample size, stratified random sampling was adopted with Taro Yamani's (1970) formula used to determine a convenient size for the study. Bowley's proportional allocation formula statistically distributed participants into their respective strata.

Instruments used

An adapted questionnaire characteristic of WHO s' Global Physical Activity was used as a data collection tool to determine level of physical activity. Body Mass Index was calculated using the National Institute of Health to determine levels of overweight/underweight, obese and normal weight and to ascertain COVID-19 risk levels. Eating habits and lifestyle behaviours were used as biomarkers to further ascertain risks of COVID-19 infections.

Validity and reliability

Cronbach alpha statistics was used to determine the internal consistency of the questionnaire items before the instrument was used in the field. The test yielded the Cronbach's Alpha of 0.8 which indicates acceptable reliability. The instrument was pilot-tested using a smaller related sample prior to its administration to the intended respondents.

Statistical treatment of data

Data presentation was performed using frequencies, percentages and presented on tables.

Ethical considerations

Informed consent was sought from study participants drawn from around workers in Masvingo urban area. Participants were free to withdraw their participation whenever they wanted. Anonymity and Confidentiality of data were established to meet ethical standards.

4. Results and discussion

In this section major study findings are explicated and clued up by two research questions that guided the study. It then builds into the discussion based on presented findings.

Research question 1: To what extent are obesity and overweight associated with coronavirus infection?

Table 1: Bio-data of Study Participants

	Sex						
	Male n=20			**Female n=20**		**Total n=40**	
		No	**%**	**No**	**%**	**No**	**%**
Age (Years)	30-35	2	10%	2	10%	4	10%
	36-49	6	30%	4	20%	10	25%
	50+	12	60%	14	70%	26	65%
Weight (kg/m^2)	65-70	4	20%	1	5%	5	12.5%
	71-80	5	25%	3	15%	12	30%
	81+	11	55%	16	80%	23	57.5%
Height (cm)	141-160	4	20%	5	25%	9	22.5%
	161-180	13	65%	15	75%	28	70%
	181+	3	15%	-	%	3	7.5%
BMI	Less than 18.5kg (underweight)	-	-	-	-	-	-
	18.5-24.9 kg (normal weight))	4	20%	3	15%	7	17.5%
	25.0-29.9 kg (overweight)	7	35%	6	30%	13	32.5%
	30kg+(obese)	9	45%	11	55%	20	50%

Demographic information show that most participants were in the 50+category, 60% and 70% for males and female respectively. This is followed by the 36-49 categories (30% males and 20% females with least number shown in the 30-35 age range.BMI indicate that most participants are obese with women contributing the highest portion (55%) than men (45%). Conversely, men are more overweight (35%) than women (30%) though figures are comparable. The BMI scores of most participants are greater than 25kg/m^2 suggesting obese and overweight cases. Figures further

suggest a physically inactive group pre-disposed to cardiovascular and atherosclerotic risks. These symptomatic risks further make them more vulnerable to COVID-19 infections with subsequent rise in mortality rates. These figures are in sync with Oguoma *et al.* (2021) who reported greater overweight conditions in men (43.5%) than women (35.9%) among Kuwait adults. Like in this study, Oguoma *et al.* (2021) revealed that women (90.5%) were more obese than men (62.9%) although figures for this study (55% women, 45% men) are below those reported among Kuwait adults. Differences could emanate from high calorie intakes and prevalence of sedentary lifestyles experienced. Nevertheless studies reinforce high burden of obesity and overweight and the likelihood of coronavirus invasion from physically redundant populations.

In respect of Cui *et al.*'s (2020) study of hospitalized COVID-19 cases in Huwan, 41% had prior cardiorespiratory challenges and were obese and overweight with BMI greater than 24kg/m^2. This relates well with results of this study in which the largest section is way above 25kg/m^2.Grassley *et al*. (2020) reported that 68%-72% of COVID-19 patients admitted in ICUs were obese and overweight while 24%-57% from Guan *et al.*'s (2020) study indicated prior cormobidities linked with coronavirus. Al-Salameh *et al*.'s (2020) report on COVID-19 hospitalized statistics at Amiens University Hospital (France) indicated that 37.7% were obese while 27.5% were overweight. Similarly, Farzanegan and Hofman's (2020) COVID-19 fatality record of 65.04% in American deaths were also linked to obesity. Although these studies are hinged on hospitalized cases, they commonly depict obesity and overweight as potentiating variables to COVID-19 invasions. This likelihood may not spare participants in this study though this could invariably contrast with research locales. They necessarily allow sport clinicians to arrive at best possible preventive measures to reduce the impact of these modifiable risks through exercise medicine. While exercise may not totally exterminate COVID-19 viral infections, this may assist in significant reductions of coronavirus epidemiology, possible hospitalizations and mortality rates in communities.

Table 2: Sedentary Lifestyle

Variable	**Males (%)**	**Females (%)**
Sedentary work?		
Yes	16(80%)	18(90%)
No	4(20%)	2(10%)
Time spend on sedentary work		
Less than 5 hours	5(25%)	3(15%)
Greater than 5 hours	15(75%)	17(85%)
Sitting activities-watching TV, handwork?		
Never	-	-
Seldom	1(5%)	1(5%)
Sometimes	4(20%)	2(10%)
Often	7(35%)	7(35%)
Very Often	8(40%)	10(50%)
Sleeping time reserved?		
Less than 6 hours	5(25%)	3(15%)
Greater than 6 hours	15(75%)	17(85%)

As indicated in Table 2, the greatest sections of participants are involved in sedentary activities with women recording the highest figure (90%) than is for men (80%). Most participants reported spending most of their time in sedentary work (75% and 85% for men and women respectively). Only small segments spend less than 5 hours in sedentary work (25% and 15%). Further, most participants show that they very often (40%, 50%), often (35%) or are sometimes (20%, 10%) involved in sitting activities for much of their times. Most of them reported having greater time reserved for sleep medicine (75%, 85%) except for a few cases (15%, 25%).This could pre-dispose them to cardiovascular and atherosclerosis risks and coronavirus invasions. While sleep medicine (rest) is crucial for physiological restorative processes, over-involvement in it in the absence of physical training further allows for development of severe and chronic obesogenic disorders. As averred by Blokhin and Lentz (2013)access body fat mass can impair cardiovascular, respiratory and thrombotic routes. Sattar *et al.* (2020) observed that challenges of this nature can reduce cardiorespiratory reserve and resilience to cope with COVID-19 viral spike (infection) which compromises immune system processes. Turning on to findings of this study, obese individuals are more susceptible to cardiorenary challenges, arterial fibrillation and pre-mature development of diabetes (Stefan *et al.*, 2020). Sattar *et al.* (2020) corroborates that COVID-19 infections may subdue pancreatic functions causing severe lymphatic dysfunctions (thromboembolism) with subsequent death. Thus, obese and overweight participants with manifold cardio-metabolic ailments in this study are at great risk of SARS-CoV-2 infections (Zhou *et al.*, 2020).

Table 3: Eating Habits of Participants

Variable	Male n (%)	Female n (%)
Fruits consumption in a week		
Less than 5 days	7(35%)	4(20%)
Greater than 5 days	13(65%)	16(80%)
Vegetable consumption a week		
Less than 5 days	6(30%)	3(15%)
Greater than 5 days	14(70%)	17(85%)
Kinds of meals taken		
Fried foods		
Yes	18(90%)	20(100%)
No	2(10%)	-
Soft drinks		
Yes	16(80%)	15(75%)
No	4(20%)	5(25%)
Snacks		
Yes	6(30%)	13(65%)
No	14(70%)	7(35%)
Breakfast		
Yes	17(85%)	20(100%)
No	3(15%)	-
Lunch		
Yes	19(95%)	20(100%)
No	1(5%)	-

Regarding food intake women show greater eating habits than men as shown by high caloric intakes in fried foods (100%), breakfast (100%), lunch (100%) and snacks (65%). Although figures for men are below those reported among women, the general trend of results is indicative of high sedentary behaviours. Further, greater calorific intakes in women may heavily contribute to obesity prevalence compared to men. With less or no engagement in intense physical exercises, the likelihood of accumulating excess adipose mass and susceptibility to coronavirus invasions is inevitable. Physiochemical processes show angiotensin converting enzyme to be a putative receptor for COVID-19invasion (Zhou *et al.,* 2020) found in substantial amounts in lungs, cardiovascular system, kidneys, gut, bladder and brain (Xiao *et al.,* 2020). Viral spike in these organs combined with angiotensin (high affinity to COVID-19) can cause severe thrombosis from venous and arterial damages. With similar analysis high adipose tissue levels, a prime target of coronavirus could be a serious threat to devastating effects of COVID-19 to obese participants in this study.

Table 4: Participants' Habitual Physical Activity Levels

Variable	**Male n (%)**	**Female n (%)**
Practice sports/physical activity weekly?		
Never	16(80%)	18(90%)
Seldom	2(10%)	1(5%)
Sometimes	2(10)	1(5%)
Often	-	-
Very Often	-	-
Weekly hours?		
Less than 1 hour	18(90%)	20(100%)
Greater than 3 hours	2(10%)	-
Level of physical activity intensity?		
Vigorous activity level	-	-
Moderate activity level	1(5%)	-
Low activity level	3(15%)	2(10%)
None	16(80%)	18(90%)
Do you spend at least 20 minutes for continuous brisk WALKING in a typical week?		
Never	17(85%)	18(90%)
Seldom	1(5%)	1(5%)
Sometimes	2(10%)	1(5%)
Often	-	-
Very Often	-	-

Pertaining to physical activity trends the majority of women (90%) and men (80%) never participate in sport or physical activities. Very few from both genders seldom (10%, 5%) or sometimes (10%, 5%) engage themselves in physical exercises. Such few cases only reserve one

hour for physical workouts with women (100%) shown to be the more physically inactive segment than men (90%). Routine exercises that raise Heart Rates are non-existent as most women (90%) and men (85%) never participate in activities of this nature. This is, however, in spite of a few segment that seldom (5% apiece) or is sometimes (10%, 5%) involved in consistent physical workout routines. The general trend of results is skewed towards more of a physically latent population. This, combined with pre-existing sedentary lifestyles, pre-disposes them to obese and overweight cormobidities hence the issue of coronavirus risk is highly inevitable. Results are in contrary to Wang *et al.* (2020), Shamsi and Shalamzari (2020) study findings in which moderate-intensity routines were observed as significant adjuvant therapy for mild-to-moderate COVID-19 effects. This as well has been seen to reduce access ectopic body fats paving way for the development of highly resistive immune capacities able to suppress symptomatic presentations of COVID-19.

Research question 2: How can obesity and overweight conditions be abated to reduce COVID-19 infection risks?

In view of the above findings most participants have overweight and obese conditions. This pre-disposes them to high risks of developing cardiorespiratory cormobidities and high adipose tissue levels. Further, this subsequently makes them more vulnerable to COVID-19 infections. Although WHO's(2018) long term physical activity guidelines (2018-2030) encourage regular 30-60 minutes at least 5 times a week of moderate to vigorous intensities in adults, results of this study portray a physically laid off group. Adherence to exercise protocols could significantly reduce excess intramuscular fat deposits, a major target of coronavirus. This capacitates enzyme activation potentiating catalytic energy catabolism routes (Moinuddin *et al.,* 2012) as well as developing highly resistive immune systems. Findings of this study further substantiate Ross *et al.*'s (2015) report in which they advances the validity of moderate intensity workouts of 30 minutes/day in a week in potentiating cardiorespiratory respiratory fitness by 9.4% and 15.6% in relation to incremental loading. This work rate significantly assists in achieving clinically significant weight loss (Swift *et al.,* 2018).

5. Conclusions

Emerging findings revealed that overweight and obesity cormobidities were connected with high risks of COVID-19 infections with subsequent high mortality rates. Most obese persons are likely to develop high concentrations of angiotensin converting enzyme in their internal organs whose high affinity levels to COVID-19 contributes to multi-damage of cardiovascular and cardiopulmonary coordination. Sedentary lifestyles and high levels of physical inactivity further exercabated the development of obese and overweight tendencies.

6. Recommendations

The study recommends that obese persons engage in aerobic and anaerobic physical training in order to trim down risks associated with COVID-19 infections. Adults need to be actively involved in HIIT of moderate to vigorous intensities for at least five times a week to develop cardiovascular fitness (CVF) and reduce burden of health-care costs. This could significantly reduce angiotensin levels, blood viral spikes and excess intramuscular ectopic fat deposits, a prime target of COVID-19 infection. This further capacitates enzyme activation potentiating catalytic energy catabolism

allowing for development of highly resistive visceral and arterial routes. Anthropometric body fitness tests are necessary to clinically ascertain Lean Body Mass and normal Body Mass Index.

References

1. Al-Salameh, A., Lanoix, J, P., Bennis, Y., Andrejak, C., Brochot, E., and Goeb, V. (2021). The association between body mass index class and coronavirus disease 2019 outcomes, International Journal of Obesity, 45, pp. 700-705.
2. Blokhin, I, O., and Lentz, S, R. (2013). Mechanisms of thrombosis in obesity, Curr. Opin. Hematology, 20(5), pp. 437-444.
3. Cai, H., Yang, L., Lu, Y., Zhang, S., Ye, C., and Zhang, X. (2021). High body mass index is a significant risk factor for the progression and prognosis of imported COVID-19: a multicenter, retrospective cohort study, BMC Infectious Diseases, 21, pp. 147.
4. Carbone, S., Del Buono, M, G., Ozemek, C and Larvie, C, J. (2019). Obesity, risk of diabetes and role of physical activity, exercise training and cardiorespiratory fitness, Progress in Cardiovascular Diseases, 62(4), pp. 327-333.
5. Cui, S., Chen, S., Li, X., Liu, S., and Wang, F. (2020), Prevalence of venous thrombo-embolism in patients with severe novel coronavirus pneumonia, Journal of Thrombosis Haemostats.18,pp. 1471-1424.
6. Farzanegan, M, R., and Hofman, H, P. (2020). A Matter of Trust? Political Trust and COVID-19 Pandemic, https://www.cesifo.org/en/wp.
7. Fryar, C, D., Carroll, M, D., and Ogden, C, L. (2018). Prevalence of overweight, obesity and Severe Obesity Among Adults Aged 20 and Over: United States, 1960-1962 through 201502016, https://stacks.cdc.gov/view/cdc/58670.
8. Guan, W., Liang, W., and Zhao, Y. (2020). Comorbidity and its impact on 1590 patients with COVID-19 in China: a national analysis, European Respiratory Journal, 55(5), pp. 540-547.
9. Jia, X., Yu, L., Cheu,Y., Liu, Q., and Bai, J. (2020). Two things about COVID-19 might need attention, Pre-prints, 10.20944/preprints. 20. 2002.0315v1.
10. Karlsen, T., Aamot, I, L., Haykowsky, M., and Rogmo, O. (2017). High intensity interval training for maximizing health outcomes, Prognosis Cardiovascular Diseases, 60, pp. 67-77.
11. Kassir, R. (2020). Risk of COVID-19 for patients with obesity, Obesity Rev. 21(6), pp. e 13034.
12. Kwok, S., Adam, S., Ho, J, H., Iqbal, Z., Turkington, P., and Razi, S. (2020). Obesity: A critical risk factor in the COVID-19 pandemic, 10(6), pp. e 12403.
13. Madjid, M., Safari-Naeni, P., and Solomon, S. D. (2020), Potential effects of corona viruses on the cardio-vascular system: a systematic review JAMA/Cardiol.doi.10.1001/jamacardio.2020.1286.
14. Milner, J, J., Rebeles, J., Dhungana, S. (2015). Obesity increase mortality and modulates the lung metabolme during pandemic HINI influenza virus infection in mice, Journal of Immunology, 194 (10), pp. 4846-4859.
15. Movahed, M, R., Khoubyari, R., Hashemzadeh, M., and Hashemzadeh, M. (2019). Obesity is strongly and independently associated with a higher prevalence of pulmonary embolism, Respiratory Investigation, 57 (4),pp. 376-379.
16. Moinuddin, I., Collins, E, G., Kramer, H, J., and Leehey, D, J. (2012). Exercise in the management of obesity, Journal of Obesity, Weight and Therapy, 2, pp. 117.
Obesity and overweight: 2020, Geneva World Health Organisation, https://www.who.int/news-room/obesity-and-overweight.

17. Oguoma, V, W., Coffee, N, T., Alsharrah, S., Arbu-Farha, M., Al-Refaei, F, H., Al-Mulla, F., and Daniel, M. (2021). Prevalence of overweight and obesity and association with socio-demographic factors in Kuwait, BMC Public Health, 21, pp. 667.
18. O'Hearn, M., Liu, J., Cudhea, F., Micha, R., and Mozafafarian, D. (2021). Coronavirus Disease 2019 Hospitalisations Attributable to Cardiometabolic Conditions in the USA: A Comparative Risk Assessment Analysis, Journal of American Heart Association, 10, pp. 1-17.
19. Richardson, S., Hirsch, J, S., Narasimhan, M., Crawford, J, M., McGinn, T., and Davidson, J, W. (2020). Presenting characteristics, cormobidities and outcomes among 5 700 patients hospitalised with COVID-19 in the New York Area, Journal American Medicine Association, https://doi.org/10.1001/jama.2020.6775.
20. Ross, R., Hudson, R., Stotz, P, J., and Lam, M. (2015). Effects of exercise amount and intensity on abdominal obesity and glucose tolerance in obese adults: a randomised trial. Ann. International Medicine, 162, pp. 325-334.
21. Sattar, N., McLinnes, I, B., and McMurray, J, J, V. (2020). Obesity is a risk factor for severe COVID-19 infection, Circulation, 142, pp. 4-6.
22. Shamsi, M, M., and Shalamzari, S, A. (2020). Exercise Training, Immune System and Coronavirus, Sport Physiology, 12 (46),pp. 17-40.
23. Slentz, C, A., Bateman, L, A., Willis, L, H., Shields, A, T., and Tanner, G. (2011). Effects of aerobic versus resistance training on visceral and liver fat stores, liver enzymes and insulin resistance by HOMA in overweight adults from STRRIDE AT/RT, American Journal Physiology, Endocrinology Metabolism, 301, pp. 1033-1039.
24. Stefan, N., Birkefold, A, L., Schulze, M, B., and Ludwig, D, S. (2020). Obesity and impaired metabolic health in patience with COVID-19, Nat. Rev. Endocrinol, 16, pp. 341-342.
25. Swift, D, L., McGee, J, E., Earnest, C, P., Carlisle, E., Nygard, M., and Johannsen, N, M. (2018). The effect of exercise and physical activity on weight loss and maintenance, Prognosis Cardiovascular Diseases, 61, pp. 206-213.
26. Varga, Z., Flamer, J, A., Steiner, P., Haberacker, S, M., and Zingermagelete, A, S. (2020). Endothelial cell infection and endothelialitis in COVID-19, *The Lancet*, 395 (10234), 1417-1418.
27. Wang, M., Baker, J., Quan, W., Shen, S., Fekete, G., and Gu, Y. (2020). A Preventive Role of Exercise Across the Coronavirus 2 (SARS-CoV-2), Pandemic Front Physiology, 11, pp. 572-718.
28. Xiao, F., Tang, M., Zheng, X., Liu, Y., Liu, X., and Shan, H. (2020). Evidence of gastrointestinal infection of SARS-CoV-2, Gastroenterology, 158 (6),pp. 1831-1833, e3.
29. Zadoo, E, K., Wundersitz, D, W, T., Hughes, D, L., Adams, M, J., Kingsley, M, I, C., Blachlock, H, A., and Wu, S, S, X. (2020). Corona (COVID-19) Coagulation and Exercise: Interactions that may Influence Health Outcomes, Seminars in Thrombosis and Hemostasis, 46 (7),pp. 807-814.
30. Zhou, F., Yu, T., Du, R., Fan, G., and Liu, Z. (2020). Clinical course and risk factors for mortality of adult patients with COVID-19 in Wuhan, China: a retrospective cohort study, Lancet London England, 395,pp. 1054-1062.