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Excessive eating and weight gain:A rare post-acute COVID-19 syndrome

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Abstract

The coronavirus disease - 2019 (COVID-19) is a multisystem illness associated with several metabolic derangements. Studies report that post-acute COVID-19 syndromes (PACs) continue to evolve, however, polyphagia is not uncommon. Herein, we report a rare occurrence of polyphagia in a patient following acute COVID-19 illness. A-41-year-old Ugandan female with a negative past medical history presented with complains of excessive appetite, eating large amounts of food, inability to feel satisfied, failure to control desire to eat, and weight gain 6 months following recovery from a mild episode of acute COVID-19 pneumonia. Her body mass index rose to 30 Kg/m^2 from 22 Kg/m^2 prior to suffering from COVID-19. There was no history of polyuria, polydipsia, pruritus, or prior eating disorder or related history. Investigation found that brain computed tomography scan was normal, fasting blood sugar to be 5.6 mmol/L (normal range, 3.9–7.0 mmol/L), adrenocorticotropin hormone level to be 8.763 pg/mL (normal range, 6–40 pg/mL), erythrocyte sedimentation rate to be 12 mm/hour (0–30 mm/hour), but there was an elevation in glycosylated hemoglobin level ($HbA_{1c,}$ 7.7%). She was commenced on psychotherapy and behavioral changes with good outcomes. Polyphagia may be one of the rare PACs, requiring further research.

Keywords: COVID-19, Polyphagia, Weight gain, Post acute COVID-19 syndrome

1. Introduction

Polyphagia is a disturbance in normal appetite that presents with excessive eating or overeating [1]. There are over 15 known causes of polyphagia, and all involve disturbance in the regulation of multiple

pathways involved in the control of food intake and energy balance [1]. The pathways are controlled by a complex interplay of the hypothalamus (ventromedial nucleus, arcuate nucleus, paraventricular nucleus, dorsomedial nucleus, and the lateral hypothalamic area), orbitofrontal cortex, nucleus accumbens, and brain stem (nucleus tractus solitarius) nuclei [[1], [2], [3]]. The pathophysiology of polyphagia is determined by a wide-range of hormones, where insulin, glucagon-like peptide, cholecystokinin, peptide YY, and α-melanocyte-stimulating hormone suppress appetite, but ghrelin, orexigenic neuropeptides, neuropeptide Y, glucocorticoids, and agouti-related peptide improve appetite [1,3]. In addition, leptin and adiponectin - adipose-derived substances involved in energy balance and body weight regulation are also implicated in the process of polyphagia. The dysregulation can be due to interruption from drugs and sensory modulators like those found in some foods e.g., smell, color, taste, etc. and associating it with some diseases e.g., diabetes mellitus (DM), malabsorption, or brain tumors [1,3].

The coronavirus disease- 2019 (COVID-19) is a multisystem disease, where post-acute COVID-19 syndromes (PACS) continue to evolve. About 36.4% of patients with COVID-19 have been reported to have central nervous system (CNS) involvement [4]. This may lead to chronic symptom experiences or residual symptoms due to the nature of the CNS damage), a condition currently known as “long haulers”, or, “long-COVID-19” [5]. Among the COVID-19 CNS long haulers, polyphagia was previously reported. However, no detailed description was given about the experience, course, or management [6]. Thus, this case report is the first to describe a patient with polyphagia following acute COVID-19 illness.

2. Case report

A 41-year-old female, who fully recovered from acute COVID-19 pneumonia six months prior, was referred by her primary care physician at the COVID-19 treatment to the psychiatric facility with complaints of frequent palpitation and restlessness. The patient's main concerns included: (i) frequent eating of large amounts of meals, (ii) increased appetite, and (iii) increase in weight; all of which started after recovering from COVID-19.

Her COVID-19 symptoms included difficulties in breathing, loss of smell and taste sensation, general body weakness (malaise), rhinorrhea, cough, fever, and loss of appetite. Real-time polymerase chain reaction (RT-PCR) test confirmed COVID-19, and she was managed from home. During treatment, as her smell and taste restored, she noticed an increased love for food. Finally, 14 days later, she was tested negative for SARS-CoV-2. Her appetite spiked, and she started to eat more than usual, from two to three meals a day, depending on the situation. She progressively increased the frequency and the amount of meals per day to two meals every 2 h during a day. This included frequent snacks and tea within the same period in a meal. She could eat the amount of food previously consumed by three members of her family. At the time, she could add 2 L of porridge with excessive amounts of sugar. She was not selective about the type of food she could eat. She could eat whatever food that was available and occasionally had an urge to eat food whenever she saw someone else eating. During her daily journeys to work, she would carry snacks and tea to use during the track. In case she needed an extra meal during travel, she could use her money for transport to buy others snacks.

Furthermore, she would eat until she could be uncomfortable but could not get satisfied. She could

wake up in the middle of the night to eat and have a good night's sleep. During this period of illness, she drastically increased in weight from 60 kg before COVID-19 to the current 76 kg. Her body mass index (BMI) increased from 22 Kg/m^2 to 30 Kg/m^2, respectively. When the patient would not eat, she would get tremors, shortness of breath, jittering, headache, pain in the legs, memory problems (e.g., forgetting where she put her documents), and irritability. Once she has eaten a snack and porridge, these symptoms would spontaneously resolve. She firmly believed that eating is a cure for her symptoms. Once, she looked for health assistance from a physician, a diagnosis of anxiety and a referral to a psychiatry unit was made.

In her past medical history, she had no menstrual disturbances. She does not have any constipation and goes to the toilet at least once a day and releases voluminous fecal matter. Despite the weight gain, she had never attempted to lose weight or reduce the amount of food she ate. She is enjoying her new way of life (that is, excessive eating habits). She has no history of eating-related disorders, anxiety, depression, mood disturbance, psychosis, or any drug abuse history; similarly, no history was reported from her family. On a further question, there was no known stressor except the feeling of guilt about why she had got COVID-19 while she observed all standard operating procedures to the dot. She has no chronic medical conditions such as hypertension, diabetes mellitus, immunological, hematological, and nutritional disorders, even polyuria, polydipsia, or pruritus.

On examination, she had no edema, pallor, lymphadenopathy, visual acuity was 6/6, and a normal visual field. She consistently had normal vitals, and the last recorded were blood pressure of 130/82, pulse rate of 78 beats per minute, respiratory rate of 20 breaths per minute, and a temperature of 36.3 °C. In addition, the rest of the physical exams were unremarkable. Her blood sugar levels were within normal ranges but have increased for a premorbid (pre-COVID-19) fasting blood sugar of 5–5.7 mmol/L, to a post-COVID-19 range of 7.2–7.3 mmol/L. The following investigations were done; day time adrenocorticotropin hormone (ACTH) was 8.763 pg/mL (reference range = 6–40), and thyroid-stimulating hormone = 4.96 μIU/mL (reference range = 0.34–5.6). However, hemoglobin A1c rose to 7.7% (reference range = 4.5–6.5%). The complete blood count, urinalysis, typhoid, stool analysis, brucellosis, renal functional test, liver functional tests (LFT), C-reactive proteins, erythrocyte sedimentation rate parameters were within the normal range. Her brain computed tomography was normal.

Based on the above information, the patient was started on behavioral management for polyphagia (i.e., creating a timetable for eating, encouraging a minimum of 30 minutes of aerobic exercises a day, and taking caffeine instead of porridge). As a result, the patient reported a mild decrease in her appetite by writing this report, BMI is maintained, and the fasting blood sugar fell to within normal range (5.6 mmol/L).

3. Discussion

3.1. Possible causes of polyphagia due to COVID-19

COVID-19 is a multisystem infection that involves the CNS causing several other symptoms such as headache, dizziness, brain fog, tremors, limb stiffness, confusion, etc., with most of the symptoms

present in CNS long-haulers [5]. The reported case describes polyphagia as a new CNS long-hauler related to the COVID-19. We hypothesize the possible mechanism to be related to the CNS meningoencephalitis following SARS CoV-2 infection [7] and the subsequent degeneration of neuronal and glial cells due to smoldering inflammatory response to SARS-CoV-2 virions, leading to neuronal degeneration [5,7]. The degeneration can lead to damage of important pathways that control appetite leading to polyphagia. In addition, the damage may lead to disruption in the neurohypophysial axis and its hormonal interplay leading to failure in appetite control. The degeneration may also be a cascade following CNS vascular damage. The COVID-19 causes vascular occlusion (immunothrombosis) due to the intense inflammatory and immunological process it induces [8], leading to ischemia of neuronal tissues involved in appetite control. Ischemia may also be secondary to severe hypoxemia due to severe acute respiratory distress syndrome during the severe phase of COVID-19 [9].

COVID-19 has several gastrointestinal manifestations including nausea, vomiting, and diarrhea [4,10]. However, polyphagia through dysregulated gastric appetite stimulation is less likely, since orexigenic factors such as ghrelin are stimulated during systemic inflammation [11]. Also, damage to the gastric mucosa does not inhibit the production of these factors. However, a compensatory mechanism from anorexia during the acute phase of the illness may lead to polyphagia.

3.2. Differential diagnosis of polyphagia related to COVID-19

The above case describes a patient with polyphagia secondary to COVID-19. However, severe other diagnoses could have been a possible cause, as reported in Table 1 .

Table 1

Differential diagnosis of Polyphagia related to COVID-19.

Other associated symptoms	Effect on weight	Differential diagnosis	Additional reasons for ruling out
Polyuria, Polyphagia	Loss	Diabetes mellitus	RBS within normal range
		Hyperthyroidism	TSH within normal range
		Acromegaly	
	Gain	Hyperadrenocorticism	ACTH within normal range
		Sudden acquired retinal degeneration syndrome	It is an acute condition, and the patient vision was normal
Diarrhea	Loss	Exocrine pancreatic insufficiency	No GIT symptoms of malabsorption
		Inflammatory bowel disease	No GIT symptoms of malabsorption
		Lymphangiectasia	No GIT symptoms of malabsorption
		Intestinal parasites	Normal stool analysis
		Hyperthyroidism	TSH within normal range
Ataxia	Gain	Central nervous system mass lesion	CT-scan findings normal
		Insulinoma	RBS within normal range
Vomiting or regurgitation	Loss	Megaesophagus	No history of dysphagia
		Inflammatory bowel disease	No GIT symptoms of malabsorption
		Antibiotic-responsive enteropathies	No history of antibiotic use since COVID acute infection
Eating disorder	Gain	Binge eating disorder	There was a known possible cause of the symptoms
		Bulimia Nervosa	There was a known possible cause of the symptoms and no purging or guilt following eating
–	–	Drug/substance-induced polyphagia	The patient was not on any chronic medications

Abbreviations: RBS = random blood sugar, TSH = thyroid stimulating hormone, ACTH = adrenocorticotropin hormone, GIT = gastrointestinal tract.

3.3. Approach to diagnosis and investigations for polyphagia secondary to COVID-19

Polyphagia is a condition that involves several systems (i.e., gastrointestinal system, endocrine and circulatory, and central nervous system). A detailed history and examination of the mentioned system should be made to rule out possible differentials (Table 1). However, several investigations are lined up to confirm the diagnosis, which includes: imaging (CT-scan and MRI), serum biochemistry panel (hormonal profiles, e.g., thyroid functional test, insulin, leptin, corticosteroids, among others; RFTs, LFTs, etc.), hematology (CBC, blood culture), urinalysis, stool analysis, cerebral spinal fluid analysis, COVID-19 related tests, among others. The majority of the investigations were performed in the present patient based on clinical signs, a method suggested by other scholars [1]. The COVID-19 related investigation may include a rapid diagnostic test to confirm the presence of antigens to COVID-19 and SARS-COV-2 viral load since severe CNS damage depends on the viral load [5].

3.4. Approach to management of COVID-19 related polyphagia

Due to the possibility of COVID-19 causing other possible causes of polyphagia, such as DM [6], correction and controlling the underlying identified pathology is the first step in management [1]. Next is to stop any offending medications such as medications to improve appetite, psychoactive substances such as antipsychotics and antidepressants [3], in addition to psychoactive substances such as cannabis that surge appetite [3,12]. Despite the pathological increase in appetite, weight reduction is important through other modalities such as exercise and swimming [1,13]. Due to the increased desire to eat, eating methods are also used to control appetite. For instance, feeding on a low-calorie and high-fiber diet in multiple small meals cause gastric distention through physical bulk and water adsorption, delaying gastric emptying, reducing intestinal transit rate, and slowing glucose absorption. Thus, reducing the stimulation of the appetite centers [1]. Appetite can further be suppressed by eating a high protein diet since it enhances satiety [1,14]. The use of caffeine has also been found to suppress appetite, and frequent use during meals and between meals is recommended [15,16]. In addition, behavioral methods have been proposed to manage polyphagia, such as cognitive-behavioral therapy and dialectical behavior therapy. However, these methods are best suited for patients with stressors, and the patient described or with COVID-19 related polyphagia has no ongoing stressors. Besides, pharmacological drugs have been used to manage polyphagia, but their role in COVID-19 induced polyphagia may require further studies.

4. Conclusions

Polyphagia has been noted as a complication of the SARS -CoV-2 infection, and the present study describes a patient with such a presentation. For individuals who have elevated appetite following the COVID-19 recovery, polyphagia should be a possible differential. However, more studies are warranted to understand the etiology, diagnosis, and management of the post-acute COVID-19 syndromes related polyphagia.

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Consent for publication

The described patient consented to the publication of the information obtained from her.

Ethical considerations

Institutional approval was not required for this case publication, but a signed confirmation from the tertiary level head of the psychiatry department was obtained. However, after recovery, the patient provided a written informed consent accepting the case to be published.

Authors' contribution

MMK, FA clerked the patient. All authors made a significant contribution to the report; they took part in drafting, revising, or critically reviewing the article, and gave final approval of the version to be published.

Declaration of competing interest

The authors declare that they have no conflict of interest.

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References

1. Laflamme D. *Canine and feline gastroenterology.* Elsevier; 2013. Polyphagia and hyperphagia; pp. 148–150. [Google Scholar]

2. Smith P.M., Ferguson A.V. Neurophysiology of hunger and satiety. *Dev Disabil Res Rev.* 2008;14(2):96–104. [PubMed] [Google Scholar]

3. Wynne K., et al. Appetite control. *J Endocrinol.* 2005;184(2):291–318. [PubMed] [Google Scholar]

4. Zheng K.I., et al. Extrapulmonary complications of COVID-19: a multisystem disease? *J Med Virol.* 2021;93(1):323–335. [PMC free article] [PubMed] [Google Scholar]

5. Baig A.M. Deleterious outcomes in long-hauler COVID-19: the effects of SARS-CoV-2 on the CNS in chronic COVID syndrome. *ACS Chem Neurosci.* 2020;11(24):4017–4020. [PubMed] [Google Scholar]

6. Juan Jose J., Noor-ul-Huda M. The effects of COVID-19 on hypothalamus: is it another face of SARS-CoV-2 that may potentially control the level of COVID-19 severity? *Int J Clin Stud Med Case Rep.* 2020;7(1) [Google Scholar]

7. Mondal R., et al. Meningoencephalitis associated with COVID-19: a systematic review. *J Neurovirol.* 2020:1–14. [PMC free article] [PubMed] [Google Scholar]

8. Nakazawa D., Ishizu A. EBioMedicine; 2020. Immunothrombosis in severe COVID-19; p. 59. [PMC free article] [PubMed] [Google Scholar]

9. Nouri-Vaskeh M., et al. Dyspneic and non-dyspneic (silent) hypoxemia in COVID-19: possible neurological mechanism. *Clin Neurol Neurosurg.* 2020:106217. [PMC free article] [PubMed] [Google Scholar]

10. Ferrey A.J., et al. A case of novel coronavirus disease 19 in a chronic hemodialysis patient presenting with gastroenteritis and developing severe pulmonary disease. *Am J Nephrol.* 2020;51(5):337–342. [PMC free article] [PubMed] [Google Scholar]

11. Mafra D., et al. Relationship between total ghrelin and inflammation in hemodialysis patients. *Peptides.* 2011;32(2):358–361. [PubMed] [Google Scholar]

12. Kaggwa M.M., et al. Cannabis-induced mania following CoViD-19 self-medication: a wake-up call to improve community awareness. *Int Med Case Rep J.* 2021;14:121. [PMC free article] [PubMed] [Google Scholar]

13. Riyahi F., Mousavi S.H., Riyahi S. Effect of moderate swimming exercise on hyperglycaemia, polyphagia, polydipsia and weight loss in streptozotocin-induced diabetic rats. *Annal Mil Health Sci Res.* 2016;14(2) [Google Scholar]

14. Weigle D.S., et al. A high-protein diet induces sustained reductions in appetite, ad libitum caloric intake, and body weight despite compensatory changes in diurnal plasma leptin and ghrelin concentrations– *Am J Clin Nutr.* 2005;82(1):41–48. [PubMed] [Google Scholar]

15. Schubert M.M., et al. caffeine, coffee, and appetite control: a review. *Int J Food Sci Nutr.* 2017;68(8):901–912. [PubMed] [Google Scholar]

16. Jessen A., et al. The appetite-suppressant effect of nicotine is enhanced by caffeine. *Diabetes Obes Metabol.* 2005;7(4):327–333. [PubMed] [Google Scholar]