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Prevalence and Factors Associated with Underweight, Overweight and

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e double burden of malnutrition is characterized by the coexistence of undernutrition and overnutrition. In 2014, approximately 462 million adults worldwide were underweight and in 2016, more than 1.9 billion adults were in excess weight condition with over 650 million of them being obese [1,2]. Before 2010, Africa region was the only continent where obesity was not a public health problem [3]. With the westernization of lifestyle, this region of the world is facing a double burden of malnutrition [4,5] and in some urban areas of Africa, the prevalence of obesity is close to 30% [6]. In West Africa, the number of people with overweight or obesity in 2018 was estimated to 52 million, of whom 35% were in urban areas with prevalence of overweight and obesity in adult population respectively 17.6% and 7.6% in 2018 [7]. Also, in Africa, undernutrition remains a concerning issue with 25 countries over 47 in that region of the world which have high (>30%) or very high (>40%) rates of stunting [8]. According to a study on child malnutrition in sub-Saharan Africa, the prevalence of malnutrition was highest in countries in East Africa and West Africa compared to the Millennium Development Goals target for 2015 [9].

Both undernutrition and overnutrition are linked with adverse health conditions. Underweight, overweight and obesity are linked to high mortality and morbidity rates [10]. Complications associated with overweight and obesity, especially diabetes and cardiovascular diseases result in the death of at least 2.8 million people each year [11].

ese complications are o en associated to elderly persons, but it has been reported that 15 million deaths attributed to non-communicable diseases occur between 30 and 69 years [12], hence the value of early detection and adequate management of risk factors such as overweight and obesity in school or students. Northern countries have become aware of the health impact of obesity and have implemented the policies necessary to manage it, unlike sub-Saharan African countries where there is lack of preventive and therapeutic policies [6]. Wasting, stunting and underweight are expressions of undernutrition and represent anthropometric indicators for the assessment of a child's nutritional status [9]. According to a study by Wesenbeeck, nearly 110 million people in West Africa do not have adequate food to meet their nutritional needs. Main undernutrition-related adverse health outcomes include de ciencies in calories, protein and vitamins, and low immune response leading to vitamin-speci c diseases, impaired physical and cognitive development, and increased risk of infection

	(N = 37 682)	(N = 25 259)	(N = 12 423)	
Age (years), Median (IQR)	22 (20-24)	21 (20-24)	22 (20-25)	<0.001**
Age (years), n (%)				<0.001*
< 20	6233 (16.5)	2699 (21.7)	3534 (14.0)	
20-22	9643 (25.6)	3606 (29.1)	6037 (23.9)	
22-25	12691 (33.7)	3917 (31.5)	8774 (34.7)	
≥ 25	9115 (24.2)	2201 (17.7)	6914 (27.4)	
Sickle cell disease, n (%)				<0.001*
No	36891 (97.9)	11989 (96.5)	24902 (98.6)	
Yes	791 (2.1)	434 (3.5)	357 (1.4)	
Asthma, n (%)				<0.001*
No	36645 (97.2)	11934 (96.1)	24711 (97.8)	
Yes	1037 (2.8)	489 (3.9)	548 (2.2)	
High Blood Pressure , n (%)				<0.001*
No	34826 (92.4)	12071 (97.2)	22755 (90.1)	
Yes	2856 (7.6)	352 (2.8)	2504 (9.9)	
Blood sugar level, n (%)				0.801*
Low†	8194 (21.7)	2681 (21.6)	5513 (21.8)	
Normal	548 (2.2)	29147 (77.3)	6906 (29.1)	

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increases with age, it should also be noted that the trend is the same in all geographical contexts. is could be explained by the fact that the age of majority (18-21 years) o en indicates the acquisition of a certain nancial autonomy and especially of food choices. Indeed, in childhood, lifestyle and food choices are the responsibility of parents, who can make decisions to protect children's health [32], but young adults, for societal reasons, very o en make choices that are contrary to a healthy lifestyle [33]. ere is an interest in targeting this age group in programs to ght against obesity and overweight.

In a multicentric study carried out in seven African countries, there was a tendency for the prevalence of being underweight to rise, starting in the early teens and then decrease between ages 15 and 16 [29].

Being female was associated with overweight and obesity. Many studies have reported similar results. is female predominance observed among obese or overweight people has been described in Senegal (OR=3; p=0.01), China (OR=2.75; p<0.001) and the United States (p=0.004) [34–36]. In addition to the socio-behavioral factors that may be involved, hormonal disturbances should also be considered to explain this female predominance. Studies have shown that women tend to have an increase in appetite and food intake in the second half of the menstrual cycle and during pregnancy, when progesterone levels are higher than usual [37]. Also, some forms of hormone replacement therapy (hormonal' contraception) can lead to excessive progesterone levels that can increase the risk of insulin resistance, which promotes fat storage rather than its use as an energy source [37]. e initiation of hormone therapy in women should always be evaluated and monitored. We also uncovered in the present study that female students were more likely to be underweight. Our data align with studies conducted in Palestine and Ukraine where underweight was associated with female gender [38,39]. Also, a study carried out in China showed the prevalence of underweight was higher among female students [40]. In contrast, a study conducted among school-going adolescent in seven African countries revealed that males had a higher prevalence of being underweight than females for every country [29].

High blood pressure was associated with overweight and obesity. Studies in various populations around the world have shown the relationship between high BMI and high systolic and diastolic blood pressure [41,42]. One of the mechanisms explaining this link is the secretion by visceral adipose tissue of molecules and hormones such as adiponectin, leptin, resistin, Tumor Necrosis Factor (TNF) and interleukin 6 (IL-6) that exacerbate obesity-related cardiovascular disease [43]. e ght against high blood pressure and other cardiovascular diseases must implicitly induce the ght against obesity and overweight because maintaining a BMI <25 kg/m2 is e ective in preventing primary high blood pressure and weight loss leads to a drop in blood pressure in most people with high blood pressure [44,45].

High blood sugar level was signi cantly associated with overweight and obesity. e link between type 2 diabetes (chronic hyperglycemia) and obesity is well known. Indeed, obese people develop insulin resistance, which is characterized by a reduction of glucose absorption by tissues with the result that blood sugar levels rise [46,47]. is underlines the importance of systematic screening for diabetes and rigorous biological monitoring of obese people.

e originality of this study lies in the size of the sample (N=37,682) and in the fact that it is the rst among the student population in Togo. However, there are some limitations to this study. e study design (cross-sectional study) did not establish cause-and-e ect relationships (temporality of events di cult to determine) between malnutrition forms and the independent variables studied. Indeed, some factors recognized in the literature as being associated with underweight, overweight, namely alcoholism, smoking, and physical inactivity [48–50], have not been measured facg

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