Prevalence and Impact of Obesity on Liver Health in the Adult Population in Cameroon: A Systematic Review and Meta-Analysis

Job Henri Mbia[1]*, Eugenie Mumah Yusinyu[2], Irène Wagou Nintcheu[1]

[1]Molecular Biology Unit, Department of Laboratory and Clinical Biology, Douala Gyneco-obstetric and Pediatric Hospital, Douala, Cameroon

[2]Department of Biochemistry and Bioinformatics, GITAM School of Science, GITAM (Deemed to be University), Visakhapatnam-530045, Andhra Pradesh, India

***Corresponding Author**

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ABSTRACT

Background: Obesity is a route cause of the metabolic syndrome (MetS) and of non-alcoholic fatty liver disease (NAFLD). Its prevalence rate grows year by year in Africa and in Cameroon in particular. The aim of this study is to determine the prevalence and impact of obesity on liver health in the adult Cameroonian population.

Methods: Google Scholar, PubMed, Science Direct and local data bases were used to search for articles published in English or French between 2018 and 2025. Data collection as well as statistical analysis were performed using Jamovi version 2.6.26. Pooled seroprevalence was calculated using the DerSimonian-Laird random effects model with raw proportions. Heterogeneity between studies was evaluated with the Q-test for heterogeneity and the I^2 statistic.

Results: A total of 19 studies including 7917 participants were used for the meta-analysis. Females were by far more represented than males. The pooled prevalence of obesity among adults was 58%. Based on body mass index and waist circumference the prevalence was 60% and 33% respectively. The prevalence of the MetS and NAFLD among obese adults was 29% and 43% respectively. These results highlight the high prevalence of obesity in adult Cameroonians and high prevalence rates for the MetS and NAFLD in obese adults.

Conclusion: Obesity plays an important role in destabilising liver health in obese Cameroonian adults by causing metabolic anomalies like the MetS and NAFLD. This puts many obese adult Cameroonians at risk of liver disease.

Keywords: Obesity prevalence, fatty liver, liver disease, liver health, Cameroon.

INTRODUCTION

Obesity is a chronic disease that can lead to a variety of health problems. It can be defined as an excessive accumulation of body fat indicated by: a body mass index (BMI) of 30kg/m^2 or greater; a waist to hip ratio (WHR) of 0.95 or more in men and 0.85 or more in women; and a waist circumference (WC) of 102cm or more in men or 88cm or more in women [1]. Obesity plays a major role in the occurrence of the metabolic syndrome (MetS), as a person's weight is a prominent trigger of the MetS [2]. The metabolic syndrome results from a combination of conditions including excess abdominal fat and abnormal cholesterol levels that increase the risk of liver disease, heart disease, stroke, type 2 diabetes, and other conditions such as high blood pressure, and high blood sugar [3]. The metabolic syndrome is strongly associated with the development of non-alcoholic fatty liver disease (NAFLD) [4], which can lead to hepatocellular carcinoma (HCC) through a chain of events that continuously degrade the liver [5]. This complex interplay of events begin with non-inflammatory intracellular accumulation of fat which leads to non-alcoholic steatohepatitis (NASH), which in

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turn may progress to hepatic fibrosis and cirrhosis, and can lead to HCC. Hepatic fibrosis and cirrhosis usually occur in people with NAFLD, which is in part associated with hyperlipidaemia and low levels of high-density lipoprotein-cholesterol (HDL-C) [6].

The BMI is significantly associated with the risk of fatty liver in which excess fat can cause inflammation and damage. In a dose-response analysis for determining the association between BMI and risk of fatty liver, high BMI ($\geq$30kg/m^2) was found to be an independent and dose-dependent risk factor for fatty liver [7]. WHR has been demonstrated to be better at predicting liver disease than BMI as it is associated with the development and progression of NAFLD. It is a measure of central obesity and the most important anthropometric indicator when predicting NAFLD [8]. WC also measures central obesity and is typically important in measuring visceral (abdominal) fat. Alongside other factors, it is also important in predicting the severity of intra liver scarring (fibrosis). Generally, a high WC comes with an increase in visceral fat which is associated with NAFLD and contributes to insulin resistance and to the overall progression of liver disease [9].

Obesity can occur as a result of an imbalance between diet (energy intake) and physical activity (energy usage), environmental and psycho-social aspects, and genetic factors. Across the globe, obesity in adults is constantly increasing, and this significantly contributes to the occurrence of non-communicable diseases and disabilities [10]. In sub-Saharan Africa, data concerning obesity and associated diseases is scarce. However, the available literature indicates that obesity rates are not uniform across all countries, as some countries have higher rates than others. There also exist differences between rural and urban areas within individual countries [11]. In Cameroon, obesity rates among adults have been on an exponential increase, predisposing them to various health issues. These rates are higher in females as compared to males [12]. Unfortunately, there is a great lack of meta-analyses to regroup the available literature into data that gives an estimate of the prevalence of obesity in the country and its impact on health, especially liver health. The aim of this study is therefore to determine the prevalence and impact of obesity on liver health in the adult population in Cameroon. This will be done as follows: (1) determine the current prevalence of obesity. We will first determine the combined prevalence of obesity, then the prevalence of obesity according to BMI, WHR and WC respectively; (2) determine the impact of obesity on liver health. To do this, we will determine the prevalence of the MetS and that of NAFLD in obese populations.

METHODOLOGY

The search for articles in English or French published between January 2018 and April 2025 was performed using Google Scholar, PubMed, Science Direct and local data bases based on the Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) checklist [13]. The terms Obesity prevalence, fatty liver, liver disease, and liver health were used during the search and each search term was also associated to Cameroon. Based on titles and abstracts, articles were screened and the selected few were fully reviewed. Additional articles were obtained from the references of fully reviewed articles. Each article was assessed prior to inclusion in the study. Each qualified paper was then critically appraised using the Joanna Briggs Institute (JBI) Critical Appraisal Tools and the Appraisal Tool for Cross-Sectional Studies (AXIS). Studies assessed with JBI each had a score of at least 50% while those assessed with AXIS had a score of at least 60%.

Cross-sectional studies, case control studies and cohort studies were included. Inclusion criteria were: (1) Full length articles, (2) Inclusion of prevalence of obesity, (3) Inclusion of adult Cameroonians, and (4) Inclusion of information about liver disease and/or metabolic syndrome. Exclusion criteria were: (1) Non availability of full length articles, (2) Studies on Cameroonians out of Cameroon, (3) Studies focusing only on pregnant women and/or children, (4) Studies that do not mention the obesity status of participants, and (5) Studies in which fewer than 80 people were tested.

Data collection and statistical analyses were performed using Jamovi version 2.6.26. After extraction of data relevant to this study, pooled prevalence was calculated using the DerSimonian-Laird random effects model with raw proportions. We chose to use a random-effects model in case there is heterogeneity among the studies due to variations in study geography and populations. We also decided not to consider any study in which fewer than 80 people were tested so as to avoid small sample bias in the random-effects model. Heterogeneity

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between studies was evaluated with the Q-test for heterogeneity and the I^2 statistic. Publication bias was assessed with funnel plots using Egger's test.

RESULTS

Search results

Our search through the data bases enabled us to identify 370 publications. From these, 65 duplicates were removed prior to screening. After screening, 230 publications were excluded either for non-compliance with our inclusion criteria or high compliance with our exclusion criteria. This left 75 publications of which 19 were found eligible after conducting full text review, and were included in our study (Figure 1).

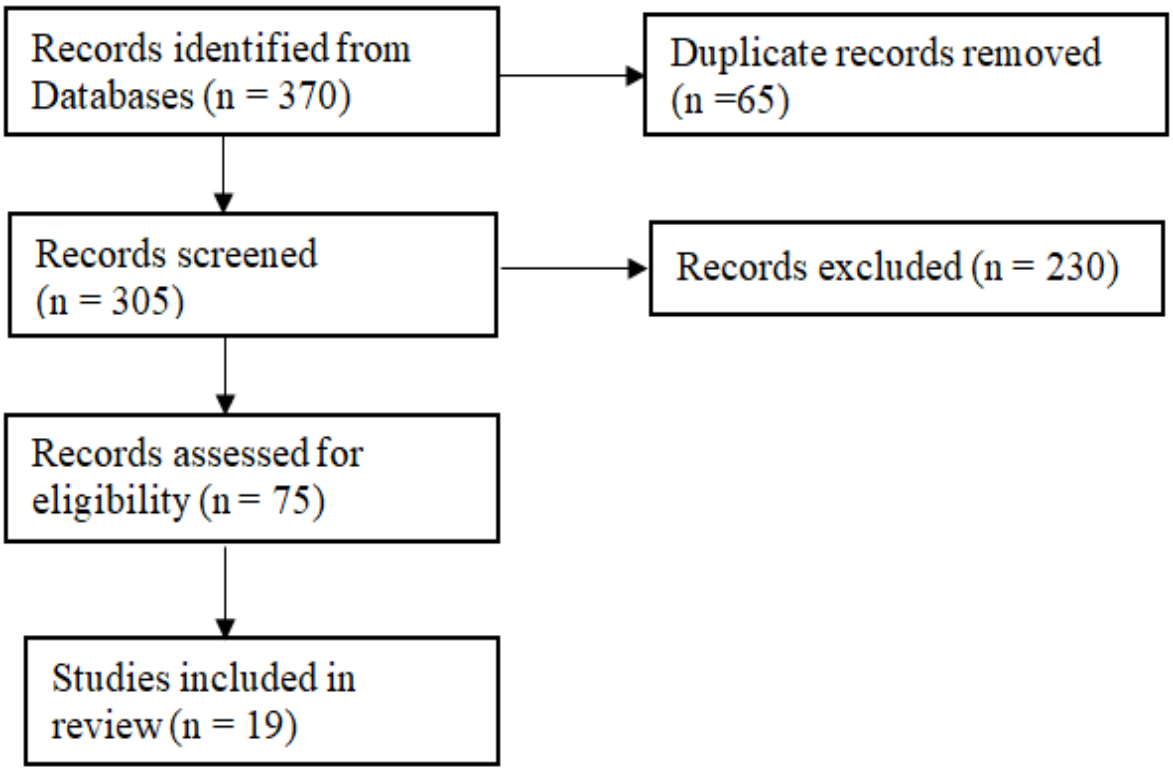

Figure 1: Identification of studies via databases.

Characteristics of included studies

The 19 studies included accounted for 7917 participants, with 4804 females, 2234 males, and 879 participants whose sex was not specified. Participants were adults of 18 years and above in the majority of studies, with certain studies having age ranges that started at ages above 18 years. In studies that included all age groups with clear distinction between minors and adults, only data for adult age groups was considered. Ten studies were used to determine the combined prevalence of obesity. Nine studies were used to determine the prevalence according to BMI while four were used to determine the prevalence according to WC [14]–[23],[24]. None of the studies used WHR to determine obesity. Five studies [15], [25]–[28] were used to determine the prevalence of the MetS and four [29]–[32] to determine the prevalence of NAFLD. Two studies focused on rural populations, thirteen studies focused on urban populations, two included urban and rural populations and two took into consideration rural, semi urban, and urban populations. One study included people living with human immunodeficiency virus (HIV) and was however considered. This is due to the fact that obesity among HIV patients increases within the antiretroviral therapy (ART) period. Patients on ART increasingly experience weight gain and obesity [33]. This type of obesity onset and its influence on liver health should also be considered. For studies that included overweight and obesity, only data concerning obesity was extracted, and for studies that categorized obesity into class I, II and III, the overall data of all classes was extracted. The 19 studies covered all regions of Cameroon except the East region. Table 1 gives a summary of the characteristics of included studies.

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Table 1: Characteristics of included studies

Studies included for the prevalence of obesity				
Authors	**Study type**	**Population of study**	**Region(s)**	**Year**
**Dabou *et al.*[b]	Cross-sectional	Urban	West	2018
Stone *et al.*[a]	Retrospective, Cross-sectional	Rural, Semi-urban, Urban	Far North, North, Adamawa, Littoral, Centre, South	2018
*Amougou *et al.*[a,b]	Cross-sectional	Urban	Centre	2019
Biyegue *et al.*[a]	Retrospective, Cross-sectional	Urban	Littoral	2020
Simo *et al.*[a]	Cross-sectional	Rural	West	2021
Moor *et al.*[a]	Cross-sectional	Urban	Centre	2022
Dakam *et al.*[a,b]	Cross-sectional	Urban	West	2022
Akob *et al.*[b]	Cross-sectional	Rural, Urban	North West	2023
Fouda *et al.*[a]	Prospective, cross-sectional	Urban	Littoral	2024
Tchokonte *et al.*[a]	Descriptive, Cross-sectional	Urban	Centre	2024
Nkanjo *et al.*[a]	Cross-sectional	Urban	South West	2025
Studies included for the prevalence of NAFLD				
Authors	**Study type**	**Population of study**	**Region(s)**	**Year**
Nga *et al.*	Analytical, Cross-sectional	Urban	Centre	2023
Nga *et al.*	Analytical, Cross-sectional	Urban	Littoral	2024
Ojong *et al.*	Cross-sectional	Urban	South West	2025
Kouam *et al.*	Descriptive, Cross-sectional	Urban	South West	2025
Studies included for the prevalence of MetS				
Authors	**Study type**	**Population of study**	**Region(s)**	**Year**
Dandji *et al.*	Cross-sectional	Rural, Urban	West	2018
Marbou *et al.*	Cross-sectional	Rural	West	2019
Bilog *et al.*	Cross-sectional	Rural, Semi-urban, Urban	Littoral	Sept 2023
Bilog *et al.*	Prospective, Cross-sectional	Urban	Littoral	Oct 2023
*= study included only in BMI and WC prevalence estimations. **= study also included in WC and MetS prevalence estimations. a= studies included for BMI prevalence estimation. b= studies included for WC prevalence estimation.				

Prevalence of obesity

There were 4626 patients in total for determining the prevalence of obesity, with 1225 males and 3401 females. The pooled combined prevalence of obesity was 58% (95% CI: 39%-78%, p <0.001) with considerable heterogeneity (I^2 = 99.6%). The regression test for funnel plot asymmetry was not statistically significant (Z=0.222, p=0.824) (Figure 2A). The pooled prevalence according to BMI was 60% (95% CI: 47%-74%, p <0.001) and that of WC was 33% (95% CI: 0.08%-57%, p <0.001) both with respectively high heterogeneities (I^2 = 98.93% and 99.06%), and the regression test for funnel plot asymmetry was not statistically significant for BMI (Z=-1.247, p=0.212) but was statistically significant for WC (Z=-1.247, p=0.010) (Figure 2B and 2C).

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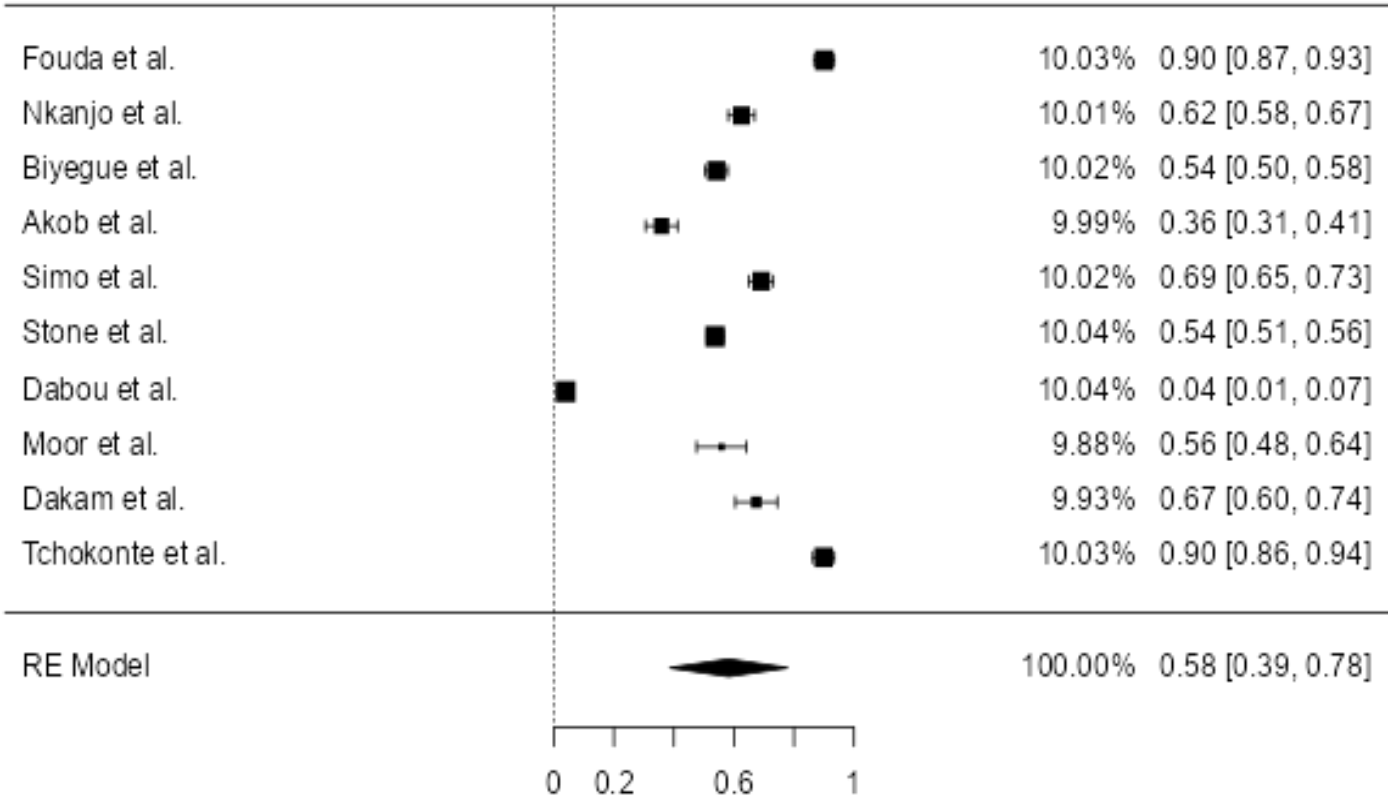
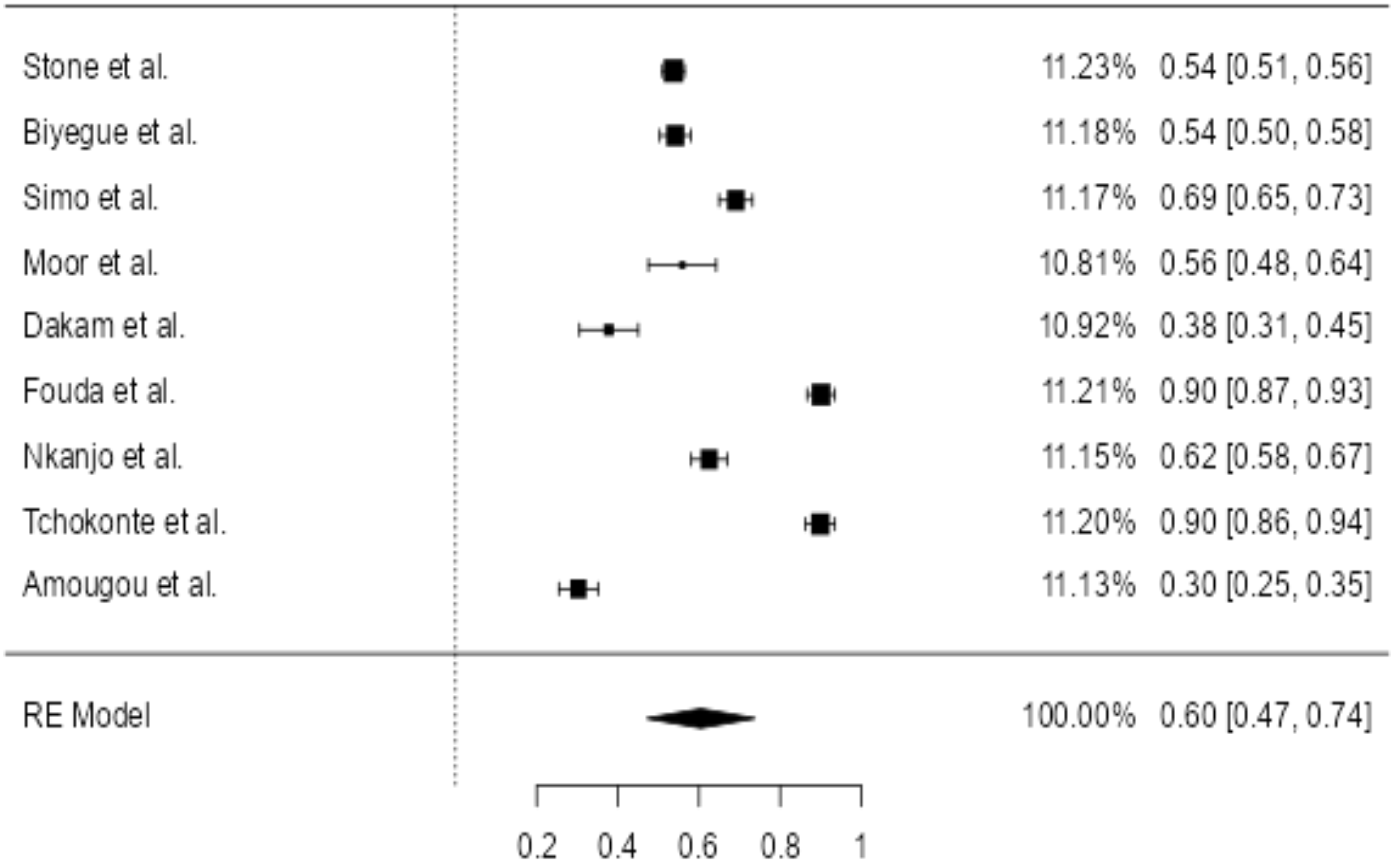
A. Combined prevalence of obesity



B. Prevalence according to BMI



C. Prevalence according to WC

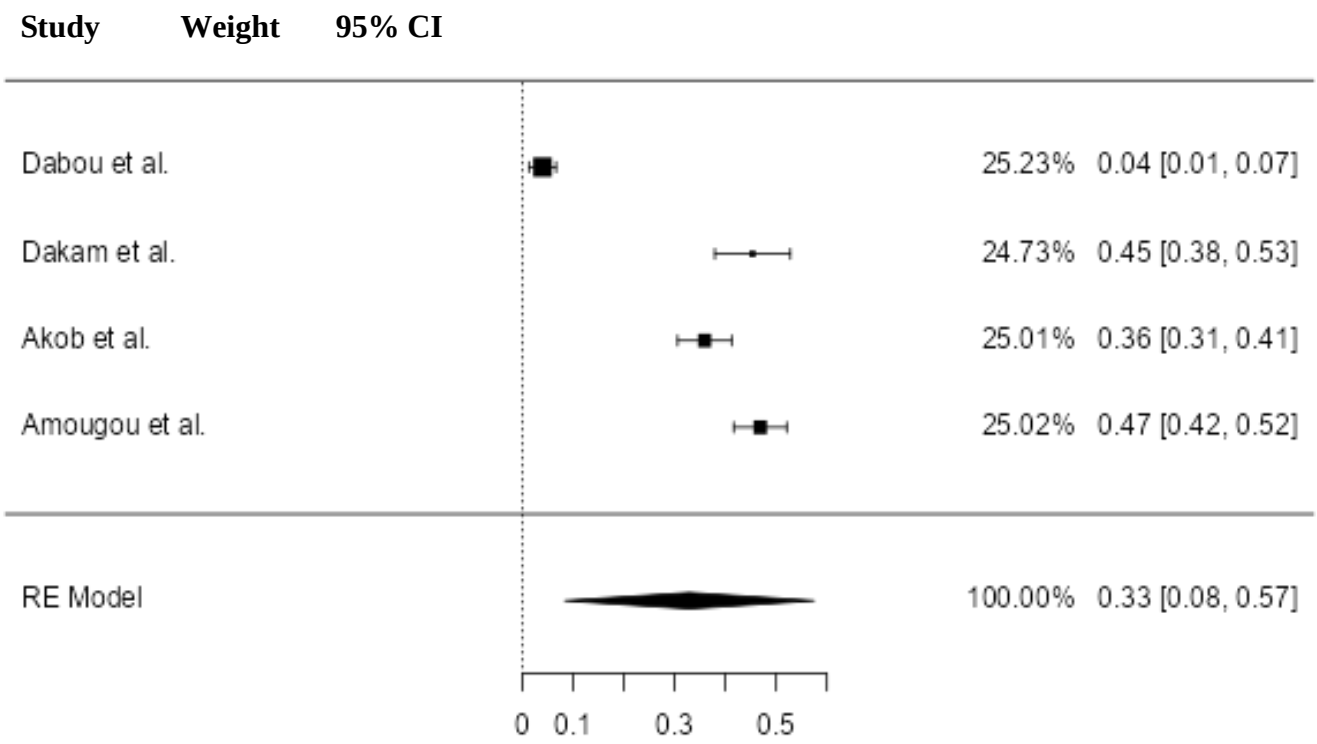


Figure 2: Pooled prevalence of; A- Combined obesity, B- Based on BMI, C- Based on WC

Prevalence of the metabolic syndrome

There were 2743 participants in total, including 841 males, 1023 females, and 879 patients with undefined sex. The pooled prevalence was 29% (95% CI: 21%-37%, p <0.001) with meaningful heterogeneity (I^2 = 95.56%). The regression test for funnel plot asymmetry was not statistically significant (Z=0.348, p=0.728) (Figure 3).

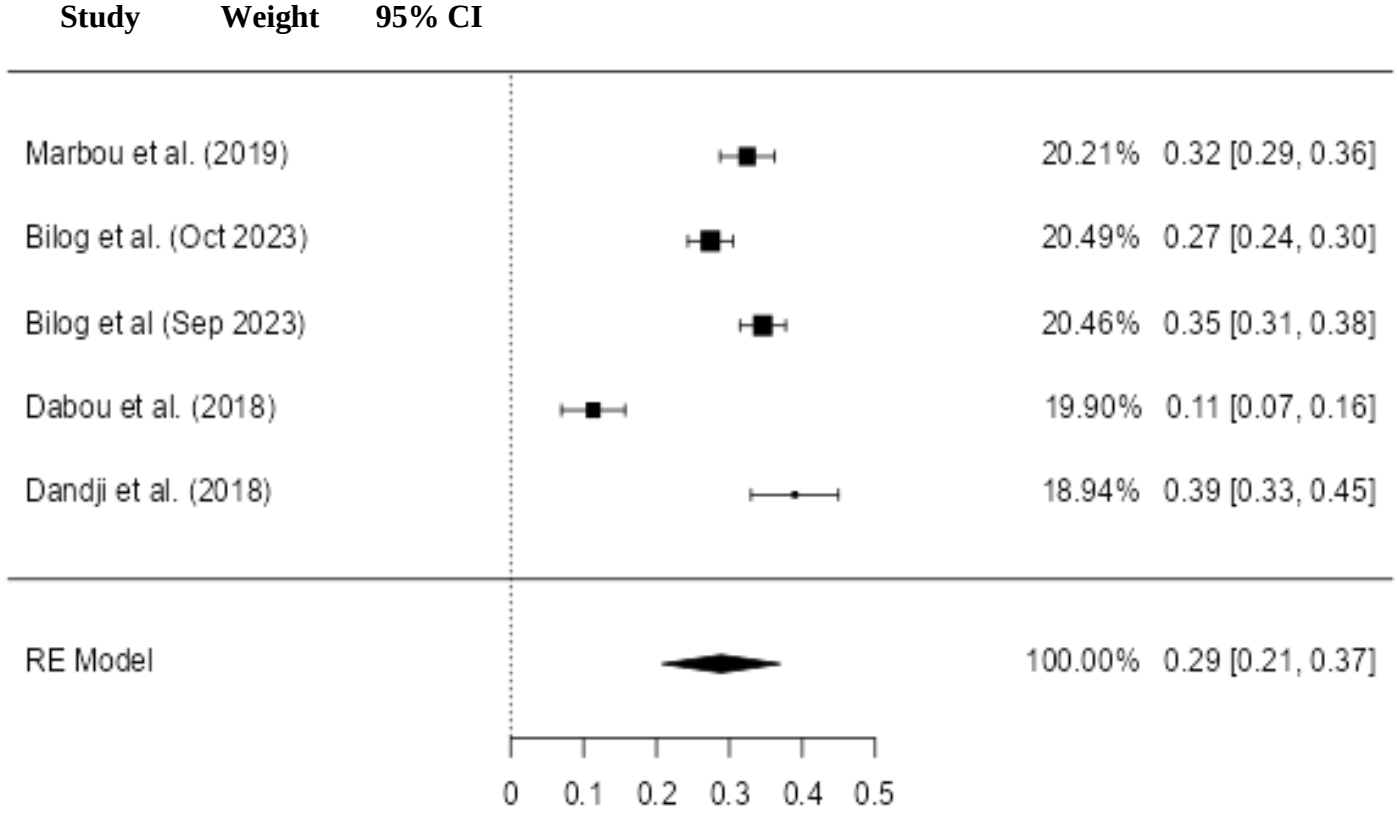


Figure 3: Pooled prevalence for the metabolic syndrome.

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Prevalence of NAFLD

A total of 548 participants were recruited. There were 168 males and 380 females. The pooled prevalence for NAFLD was 43% (95% CI: 24%-61%, p <0.001) with substantial heterogeneity (I^2 = 95.46%). The regression test for funnel plot asymmetry was not statistically significant (Z=0.937, p=0.349) (Figure 4).

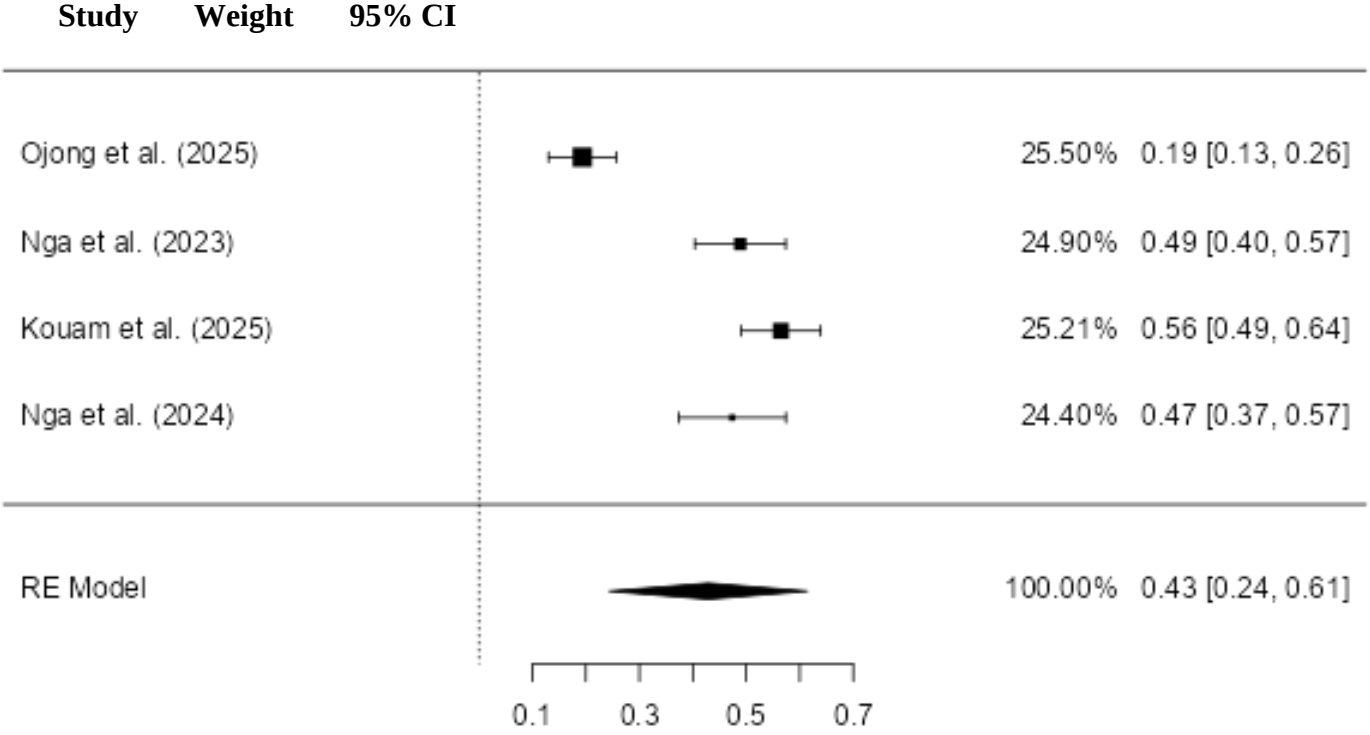

Figure 4: Pooled prevalence for non-alcoholic fatty liver disease.

DISCUSSION

This systematic review and meta-analyses on the prevalence of obesity and its impact on liver health among 7917 adults living in Cameroon disclosed elevated rates of obesity and a substantial impact of obesity on liver health. The combined prevalence of obesity was 58%. Based on BMI alone, the prevalence was 60%, and based on WC it was 33%. The prevalence of the MetS was 29% and that of NAFLD was 43% among obese adult Cameroonians. These results showed high heterogeneity which can be explained by variations in study methodologies and differences in study populations. There was no case control study among those that were included, so it was not possible to directly determine the association between liver disease incidence and obesity. However, the prevalence of MetS and that of NAFLD were used as an indication of the impact of obesity on liver health in adult obese Cameroonians.

This prevalence of obesity at 58% is the first of its kind as concerns meta-analyses studies on adult obesity in Cameroon. The only other meta-analysis available online, which is that of Nansseu *et al*., only had prevalence for obesity based on BMI, and based on WHR and WC [12]. The present prevalence was largely superior to the 14.3%, 14.5%, and 15.0% obtained by Adeloye *et al*. (2021), Chukwuonye *et al*. (2022) and Ramalan *et al*. (2023) respectively in Nigeria [34]–[36]. Their findings show a noticeable gentle rise in adult obesity prevalence in Nigeria as compared to Cameroon. As neighbouring countries, they are similar in numerous aspects. However, it seems Cameroon is very advanced in terms of adult obesity progression. As of 2023, Nigeria's population was of 223.8 million while that of Cameroon was 28.7 million [37]. This could be a potential explanation for the difference in obesity prevalence, as the obesity population in Nigeria may be greater than or equal to that of Cameroon but in the context of their various overall populations the prevalence rate of Nigeria will be inferior to that of Cameroon.

The prevalence of obesity based on BMI of 60% is far greater than that obtained by Nansseu *et al*. in 2019 (15.1%) for adults living in Cameroon [12]. This large difference could be due to; the study period which goes

from 2000 – 2017 for Nansseu *et al*. and from 2018 – 2025 for the present study; the total population size, which was of 55155 participants compared to 7917 participants. The prevalence of obesity has been on a constant increase according to the studies included in the present meta-analysis. Compared to the studies included in the meta-analysis of Nansseu *et al*., the studies included in the present study have higher rates for obesity. According to the Global Obesity Observatory, obesity rates have been increasing year by year among Cameroonians especially among the female population [38]. This prevalence may therefore represent the actual current situation of obesity in Cameroonian adults. The lack of research and publications on obesity in Cameroon hindered the availability of real and impactful data on the situation of obesity. This has fortunately changed over the years as obesity was increasingly recognised as a threat to health. Central (abdominal) obesity (WC) tends to have a fast growth rate in urban Cameroonian populations when compared to overall obesity (BMI). The present study obtained a pooled prevalence for central obesity of 33%. This prevalence is higher than the 16.4% obtained by Nansseu *et al*. [12], while it is approaching the of 46.7% obtained by Nyakundi *et al*. in Kenya [39]. It is known that the socioeconomic status is a factor that influences the prevalence of central obesity [40]. Many Cameroonians view central obesity as a sign of wealth and more or less of good health. There is yet much left to be done to have a mastery of the tendency of the prevalence of obesity in the adult Cameroonian population.

Obesity puts the liver at risk of disease as it is a main contributor in the occurrence of NAFLD and the MetS [2], [4]. The prevalence of NAFLD and MetS in sub-Saharan Africa are largely underestimated [41], likely due to extremely rare data. Our results show a prevalence of 43% for NAFLD. Onyia *et al*. (2024) found a prevalence of 36.4% in Nigeria. They went through a case control study to compare the incidence of NAFLD in obese and non-obese participants which showed that the degree of obesity, among other metabolic parameters, is associated with NAFLD. Their results also showed that NAFLD had a high prevalence in the presence of the MetS [42]. These findings enabled us to validate our linking of the prevalence of obesity to that of NAFLD and the MetS. Sindato *et al.* (2025) found a prevalence for NAFLD of 34.4% for West Africa, 24.6% for East Africa, and 26.9% for Southern Africa [43]. Their results also showed that obesity is a risk factor for NAFLD and MetS. We obtained a prevalence of 29% for the MetS. Chukwuemeka *et al*. (2025) found a prevalence of 35% in Nigeria [44]. Their results show that high stress and obesity are the leading causes of the MetS. Indeed oxidative stress plays a role in human feelings of stress. It can damage cells and tissues which will initiate inflammatory responses that disrupt normal body functions. These consist of functions that are linked to mood and stress regulation. Other studies also show that oxidative stress can be linked to anxiety and depression [45].

Limitations of the study

Our results have to be interpreted in the context of some limitations. The first limitation is common to systematic reviews of this kind. This is the substantial heterogeneity found between studies pooled in our meta-analysis, which is very difficult to avoid. In order to minimize this, we made sure included studies were similar enough to be pooled together. Secondly, not all the regions of Cameroon were represented. The East region for example was not represented. Some regions had more studies than the others. The sampling method was not random in all studies, which were for the most part unequally conducted in urban and/or rural areas. Thirdly, bias was detected in the pooled prevalence of obesity according to WC. This was acceptable and could be explained by the fact that those were the only studies including WC at the time this analysis was performed. The low number of studies combined with the varying characteristics of the studies were additional factors leading to the occurrence of bias. These limitations may hinder the applicability of our findings to the entire adult Cameroonian population. Nonetheless, our results provide an updated estimate of the burden of adult obesity.

CONCLUSION

This study aimed at finding the prevalence and impact of obesity on liver health in the adult population in Cameroon. Our systematic review and meta-analysis revealed elevated rates of obesity among Cameroonian adults. We established a clear link between obesity, the MetS and NAFLD, and found high rates of the MetS and NAFLD among obese adult Cameroonians. This enables us to conclude that obesity can directly and indirectly influence liver health. The effects of obesity are still widely underestimated, be it in Cameroon, in

the Central African region or in Africa as a whole. This may be attached to the unfortunate lack of studies that highlight the threat that obesity represents and a generally uninformed population. These urgently need to be amended and can be addressed by; reducing disparities between knowledge, attitude and practices related to obesity among Cameroonian populations through community education; and performing research that brings more light on the prevalence of obesity in untouched populations and highlighting its incidence on liver health.

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