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From Numbers to Insights: Bibliometric Analysis of Obesity and Heart Disease Research Output

Sally Sonia Simmons[1, 2], John Elvis Hagan Jr[3,4*], Medina Srem-Sai[5], Thomas Schack[4]

[1] Department of Social Policy, London School of Economics and Political Science, London, United Kingdom
[2] Institute of Demography, National Research University-Higher School of Economics, Moscow, Russia
[3] Department of Health, Physical Education & Recreation, College of Education Studies, University of Cape Coast, Ghana
[4] Neurocognition and Action Research Group-Biomechanics, Faculty of Psychology & Sport Sciences/CITEC, Bielefeld University, Germany
[5] Department of Health, Physical Education, Recreation and Sports, University of Education, P. O. Box 25, Winneba, Ghana

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ABSTRACT

Despite significant research advancements, there remain important gaps in the understanding and directions for future investigations regarding obesity and heart disease. Therefore, this study examined the research output on obesity and heart disease across different countries and regions worldwide from 1970 to 2022. Using bibliometric analysis, a comprehensive dataset of 28,315 published articles related to obesity and heart disease was analysed. Specifically, the trends, patterns, recurring and spatial distribution of topics per the income level of countries and indices for measurement in obesity and heart disease research were analysed. A noticeable increase in research activity on obesity and heart disease was established across all regions globally. Notably, North America, Europe, and Central Asia exhibited a higher prevalence of research in these areas, while Sub-Saharan Africa and South Asia showed comparatively lower levels. The research encompassed a diverse range of themes, with a significant proportion of studies focused on obesity indices and comorbidities associated with these conditions. Other results revealed the identification of various anthropometric indices, biomarkers, and comorbidities from the examined studies. Body mass index, waist-to-hip ratio, waist circumference, hip circumference, fasting blood glucose, cholesterol, and lipoprotein levels emerged as recurring indices in the literature. Additionally, prevalent comorbidities associated with obesity and heart disease included diabetes, stroke, and metabolic syndrome. The findings can guide future research endeavours and public health interventions targeted at addressing the complex challenges posed by obesity and heart disease. This study underscores the global significance of obesity and heart disease as areas of scientific inquiry. Thus, this study serves as a clarion call for sustained and collaborative efforts, emphasising the pivotal role of on-going research in forging a healthier and more informed global future.

Keywords: anthropometric indices, BMI, bibliometry, biomarkers, countries

List Abbreviations

AU: Australia
AT: Austria
BD: Body density
BE: Belgium
BMR: Basal metabolic rate
BR: Brazil
BSS: Body surface area
BV: Blood volume
CA: Canada
CC: Chest circumference
CHR: Chest-to-hip ratio
CL: Calf circumference
CL: Chile
CN: China
DZ: Algeria
EB: Elbow breadth
GFD: Gluteofemoral fat mass
DK: Denmark
EG: Egypt
EU: England
FI: Finland
FR: France
NL: Netherlands
HB: Head breadth
HC: Hip circumference
HHR: Hip-to-height ratio
HICs: High-Income Countries
KB: Knee breadth
LBM: Lean body mass
LMICs: Low- and Middle-Income Countries
IN: India
IE: Ireland
JP: Japan
MX: Mexico
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SE: Sweden
SMM: Skeletal muscle mass
STR: Standing height
TC: Thigh circumference
TCR: Thigh-to-calf ratio
TL: Trunk length
TR: Turkey
US: USA
WC: Waist circumference
WCR: Waist-to-hip ratio
WRC: Wrist circumference
WHR: Waist-to-height ratio
WHTHR: Waist-to-hip-to-thigh ratio
WHTR: Waist-to-hip-to-trunk ratio
WOS: Web of Science
WTR: Waist-to-thigh ratio

Introduction

Navigating the intricate terrain of public health requires a keen understanding of the multifaceted challenges posed by prevalent health issues. In this dynamic landscape, obesity emerges as a significant risk factor, intricately linked to the development of hypertension, dyslipidaemia, insulin resistance, and inflammation-precursors that propel the progression of heart disease[1]. Consequently, the rise in obesity rates has been accompanied by a parallel increase in the prevalence of heart disease[2-6]. These health conditions are influenced by diverse factors and exert profound impacts across socioeconomic strata[7-9]. Obesity, a complex health condition with far-reaching implications, is commonly assessed through anthropometric indices and biomarkers. Anthropometric measures, such as body mass index (BMI), waist-to-hip ratio (WHR) and waist circumference (WC) provide a quantitative assessments of an individual's body composition and fat distribution[10] whereas biomarkers like fasting blood glucose, cholesterol, and lipoprotein levels provide endoscopic assessment of the body's composition[11].

While a plethora of studies, including those by[1,7,8,12-14] have probed various facets of the intricate relationship between obesity and heart disease, a critical gap remains, as the structure of knowledge encompassing thematic and spatial patterns, recurring topics, and connections between different concepts related to obesity and heart disease, remain inadequately understood. Therefore, evaluating the structure and dynamics of scientific knowledge on this complex relationship is crucial and holds high value for a holistic understanding of the content and trends of research on obesity and heart diseases and informs the development of effective health policies and research strategies.

This study employs a bibliometric analysis to discern pertinent publications worldwide regarding obesity and heart disease. Bibliometrics is defined as "the application of mathematical and statistical methods to books and other media of communication"[15]. This methodology enables the comprehensive analysis of a substantial body of scientific literature within a particular research domain. Applying this approach to obesity and heart disease research provides a valuable means to scrutinise trends in published works over time, recurring areas of interest and topics, identify research gaps for future endeavours, explore innovative applications, highlight research significance, and pinpoint key references on a given theme.

This study provides a comprehensive review of the current literature on obesity and heart disease. By examining the trends, topics, geospatial contributions of studies on these conditions, the study uncovers and categorises dynamic or prevalent themes within the body of literature on obesity and heart disease. Besides, this comprehensive review is essential for directing future research efforts towards unexplored or underexplored facets of obesity and heart disease, contributing to a more comprehensive understanding of the content of exiting information.

Materials and Methods

DATA SOURCE

Data for the study was retrieved from the Web of Science (WOS) from 1970-2022. WOS is a comprehensive research database and citation index that provides access to a vast collection of scholarly literature across various disciplines[16,17]. Researchers, scientists, and scholars widely use WOS to search and retrieve academic articles, conference proceedings, and other research[18,19]. Furthermore, the period from 1970 to 2022, witnessed significant lifestyle changes, medical advancements and public health policies associated with diseases cardiovascular diseases[1] Consequently, studying

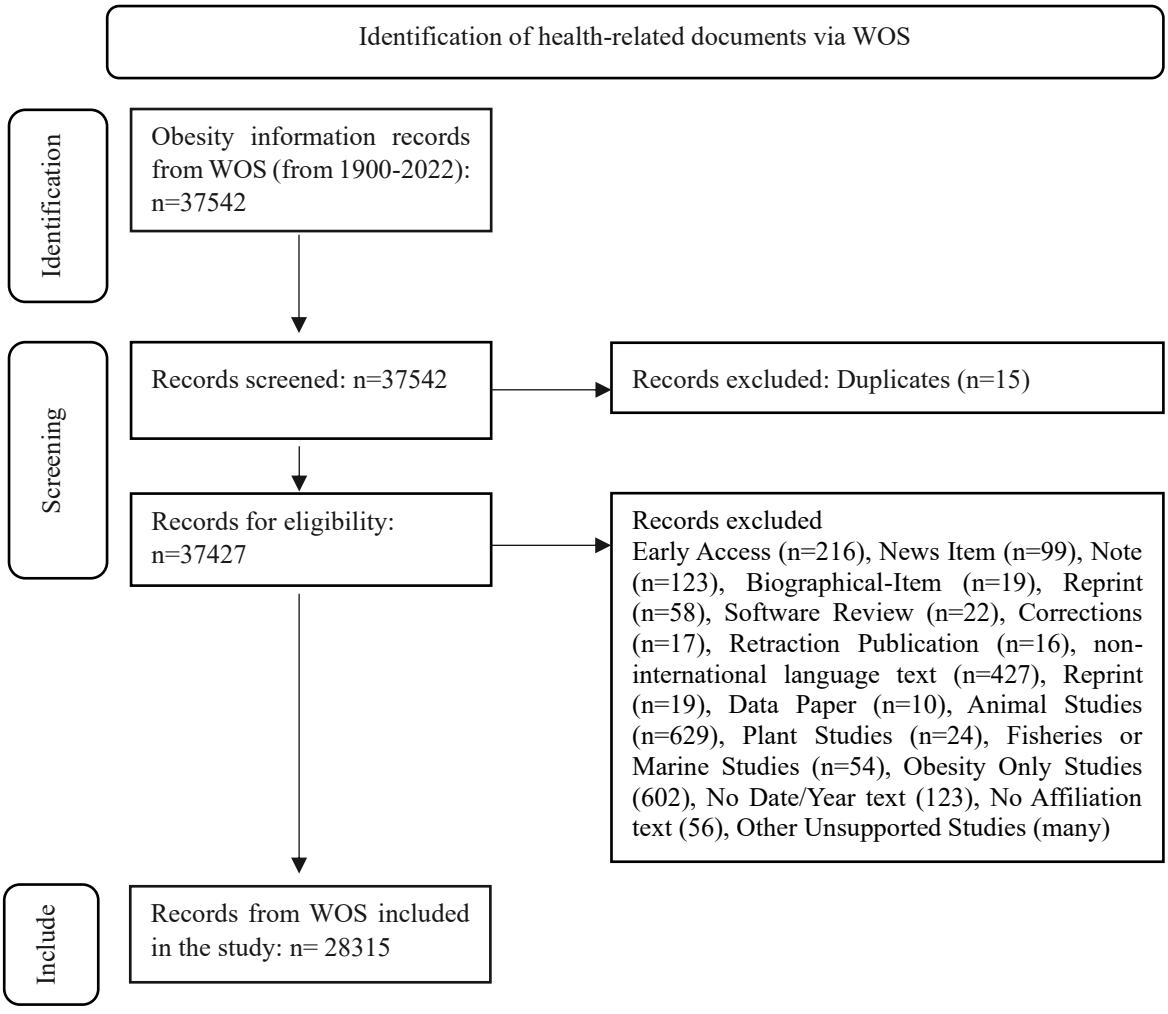
this period allows for considering the effects of those shifts in livelihood to better understand the long-term trends and changes in obesity and heart disease epidemiology.

MEASUREMENTS

Web of Science (WOS) Data Extraction, Inclusion and Exclusion Criteria

To review and synthesise the literature on obesity and heart disease, we utilised the preferred method for systematic reviews and meta-analyses (PRISMA) approach. This approach ensures a systematic and transparent process of gathering, evaluating, and synthesising relevant research findings in a rigorous and reproducible manner. Following the PRISMA guidelines, the goal was to present a comprehensive and reliable overview of the current evidence regarding the association between obesity and heart disease[20]. Specifically, we utilised the PRISMA guidelines to identify studies that addressed both obesity and heart diseases. This approach was grounded in the recognised correlation between obesity and heart diseases, as highlighted by Powell-Wiley and colleagues[1]. Consequently, there was an unrestricted title search using "obesity," “obese,” "heart diseases," "heart," "disease," "diseases," “coronary heart disease,” "ischaemic heart disease," "coronary disease," "cardiovascular disease," or "cardiac disease," from the WOS database. The initial sample for the study consisted of 37,542 documents. To improve the quality and focus of the text, certain types of documents were excluded from the analysis, such as obesity only text, no affiliation and date texts, data papers, corrections, news items, reprints, software reviews, notes, early access articles, biographies, non-international language texts, and retractions. The main bibliometric information extracted from the retrieved texts included abstracts, affiliations, and the year of publication. Careful evaluation of the abstracts was conducted to determine their relevance to obesity and heart disease. Studies that did not involve human populations, including animal and microbial studies, were also excluded. As a result, a final sample of 28,315 documents was included in the study. Further details on the process of document selection and retrieval can be found in Figure 1.

Figure 1: Preferred Method for Systematic Reviews and Meta-Analyses (PRISMA) flowchart of obesity and heart disease research documents retrieved from Web of Science (WOS)



Source: Author’s Construct
Note: PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

BIBLIOMETRIC INDICATORS

The study used a bibliometric approach, a quantitative method used to analyse patterns and trends in literature[1,15]. Two (quantity, and intellectual) broad bibliometric analysis measures were documented in the study. First, the quantity index, comprised the

contextualised trends in obesity and heart disease studies, distribution of biomarkers, anthropometric indices and comorbidities of obesity and heart disease, and second index, intellectual, focused on the topics and themes from abstracts and distribution of the topics across various countries and regions of the world. To overcome potential alterations in obesity and heart disease search results, the study used data retrieved on the 3rd June 2023.

STATISTICAL ANALYSIS

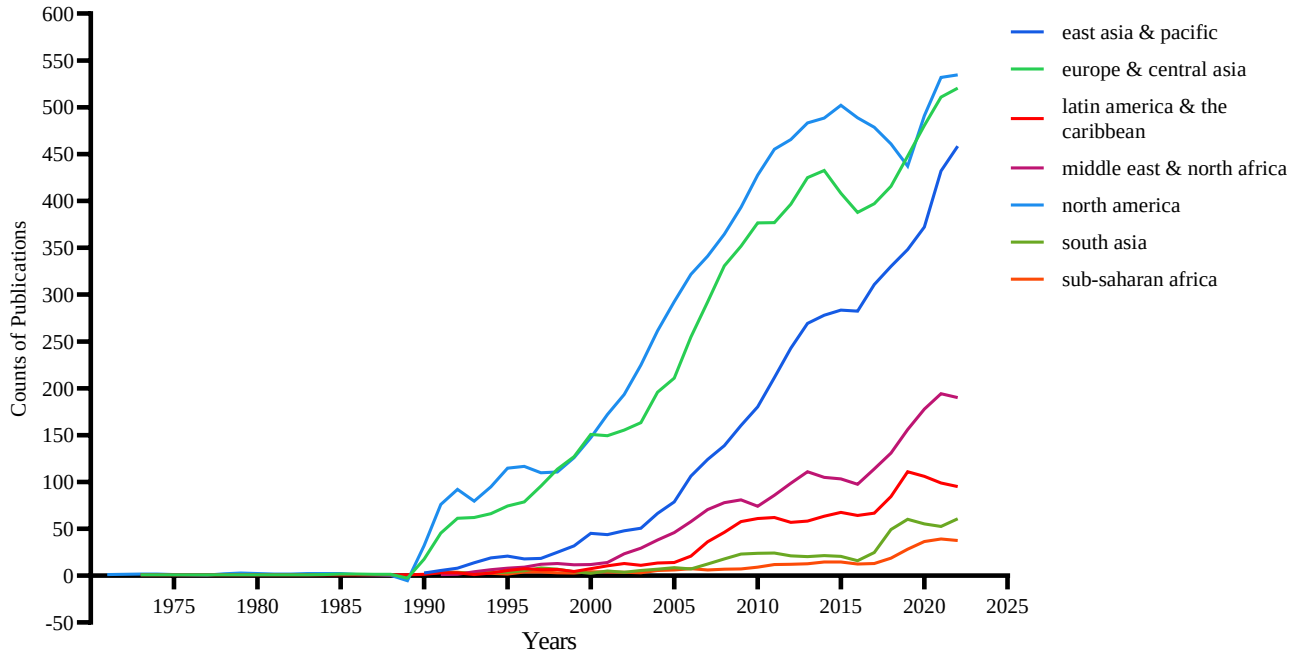
Data management and analysis were conducted using R software. R programme is a software environment and programming language designed for statistical analysis, graphical representation, and data reporting. To conduct bibliometric analysis, the dplyr, bibliometrix, quanteda, wosr, tidyr, tidybib, and ggplot2 R packages for the analysis were utilised. The text underwent grammatical manipulation using dplyr. The WOS text was transformed from a bib file to R-readable text using bibliometrix, wosr, and tidybib. Quanteda and tidyr were employed for the topic modeling analysis. All plots were generated using ggplot2[22-27]. The study described and modelled topics using the WOS documents to shed light on the research landscape surrounding obesity and heart disease from the extant literature. For the descriptive analysis (trends in obesity and heart disease research per location and the biomarkers, anthropometric indices and comorbidities inclusivity by year of publication and location) were estimated. The anthropometric indices, biomarkers, and comorbidities employed for monitoring the indices across different countries of origin and each research document are detailed in Table 1, presented in the appendix.

The latent semantics of each abstract were extracted and used to create topic models[28]. In detail, the abstracts and country names (affiliations) were extracted from the documents and used to create a corpus and tokens (terms)[29-32]. Following this procedure, a document term matrix (DTM) was computed to show the frequency of terms that occurred in the tokens[33]. A latent dirichlet allocation (LDA) algorithm was applied to the DTM to conduct topic-word content analysis. The LDA is a hierarchical Bayesian approach that discovers a set of themes or topics based on the words that co-occur within tokens generated from a set of documents[28,34]. Fifteen (15) best suited topics were generated to convey the narratives in the texts under study. These topics were further classified across space and by wealth or income. The method has the potency to highlight the contribution of countries to the themes (topics)[35,36].

Results

Figure 2 provides a comprehensive depiction of the evolving research landscape concerning obesity and heart disease spanning the extensive timeframe from 1970 to 2022. During the initial years, a limited number of studies addressed these health issues, with a notable concentration in North America and Europe. The pivotal shift occurred around 1990, marking a substantial upswing in research activity, particularly in these aforementioned regions. Despite the heightened global interest, the epicentre of publications remained entrenched in North America, Europe, and extended to Central Asia, East Asia, and the Pacific regions. Conversely, Sub-Saharan Africa and South Asia witnessed a gradual increase in research output, reaching a noteworthy inflection point in the years following 2015. This intricate timeline underscores the nuanced regional dynamics and evolving research emphasis on obesity and heart disease over the decades.

Figure 2: Trends in Obesity and Heart Disease Research



Source: Author's Construct based on data from[37]

The emerging themes (the most common topics) for obesity and heart disease research are depicted in Table 1. From Table 1, fifteen (15) topics and terms are presented. Thirteen (13) out of the 15 topics are relevant to the study. However, four (population characteristics).

Table 1: Topics in Obesity and Heart Disease Research

Topics	Content	Emerging themes
1	active, physical, related, intake, behaviour, lifestyle, report, fruits, find, food, evc, exercise, well, fatty, alcohol	impact of lifestyle on health outcomes
2	age, year, participate, adult, individual, score, mean, older, base, data, estimate, sex, follow, cohort, status	population characteristics and analysis
3	bmi, body, index, mass, kg, overweight, normal, whtr, measure, greater, mean, respective, higher, increase, total	anthropometric indices and measurements
4	weight, change, increase, effect, improve, decrease, treatment, week, day, intervention, reduce, loss, month, term, reduction	weight change and intervention
5	women, men, prevalence, among, population, higher, age, countries, educate, survey, geospatial, sampling, differ, cross, sex	gender- and country-specific prevalence rates
6	blood, pressure, male, subject, female, hypertension, systolic, diastolic, left ventricular function, significant, mean, arteries, parameter	biomarkers and population characteristics and health
7	patient, vs, clinic, failure, severe, hospital, chest, artery, outcome, without, include, breath, present, primarily, screening	cardiac health and the screening of patients
8	metabolic, insulin, syndrome, glucose, resist, increase, fast, subject, association, high, suggest, elevate, individual, marker, reserve	metabolic syndrome and insulin resistance as comorbidities
9	level, high, cholesterol, low, serum, lipid, hdl, total, lipoprotein, mg, plasma, densities, concentrate, triglyceride, resist	biomarkers
10	risk factor, circulatory, dse, chest, smoke, event, high, population, historical, major, tifi, prevent, known, include	cardiovascular risk factors and prevention
11	associate, measure, analysis, waist, independent, model, variable, circumference, relationship, regression, ratio, predict, correlate, assess, abdomen	methods and anthropometric indices for obesity assessment
12	diabetes, type, dse, pressure, high, chronic, develop, condition, mellitus, case, include, medication, disorder, common, morbid	chronic conditions and common comorbidities
13	associate, ci, mortal, adjust, ratio, grip, death, intervention, odds, ca, increase, cases, follow, model, multivariate	statistical modelling factors associated with mortality and interventions
14	group, significant, control, compare, differ, rate, higher, lower, two, test, non, similar, show, found, statistics	statistical modelling
15	fat, diet, visceral, increase, adipose tissue, expression, function, induced, effect, acidic, protein, high, mechanised, response	risk factors and adipose

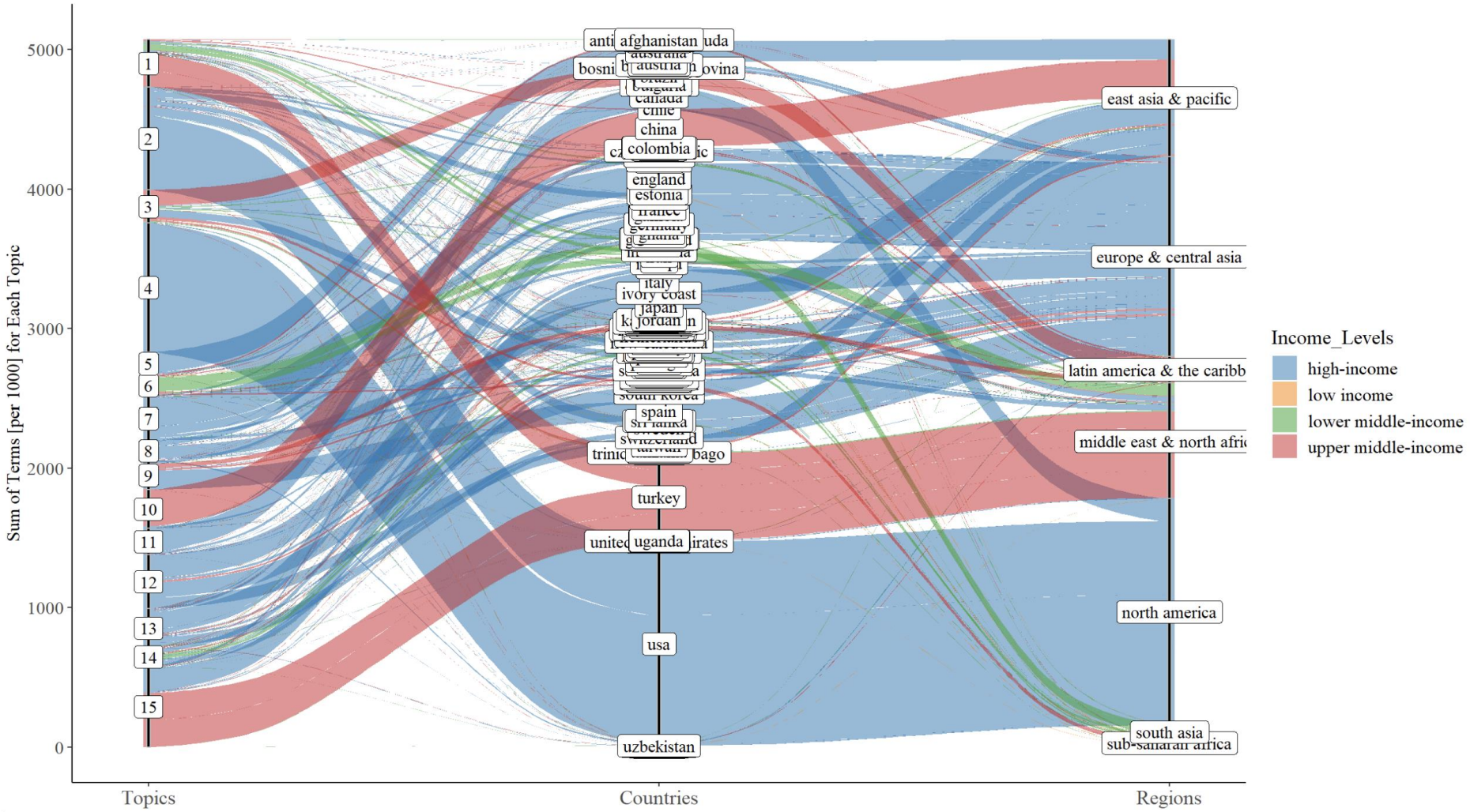
Source: Author's Construct based on data from[37]

Note: vs is vital signs, whtr is waist- height ratio, evc is expected value of control, dse is disease-specific education, hdl is high density lipoprotein, tifi is transiliac internal fixator, ci is confidence interval, mg is milligram

biomarkers and anthropometric indices for health assessment, comorbidities of obesity and heart diseases and lifestyles or behavioural factors influencing obesity and heart diseases) groups of themes emerged from these topics. Population characteristics themes emerged from Topics 2 and 5. Biomarkers and anthropometric indices for health assessment themes emerged from Topics 3, 4, 6, 9 and 11. Comorbidities of obesity and heart diseases emerged from Topics 7, 8, 10, 12. Lifestyle factors theme originated from Topic 1. Words such as women, men, countries, sex, adult population characteristics themes were captured. Biomarkers and anthropometric indices for health assessment topics contained words like bmi, weight, waist to height ratio (whtr), systolic and diastolic blood pressure. Comorbidities of obesity and heart diseases topics contained words such as artery, chest metabolic, insulin, syndrome, and glucose.

Figure 3 unveils the economic classifications and regional disparities of geographic dispersion of the origins of fifteen distinct topics within the realm of obesity and heart disease research, offering a nuanced perspective on the global landscape (see table 1 for the content of topics 1 to 15). The spatial analysis reveals discernible variations in the distribution of topic origins, with a concentration in countries classified as high-income countries (HICs, blue) within North America, Europe, Central Asia, East Asia, and the Pacific. Prominently, HICs such as the USA, England, Italy, Japan, Estonia, and Spain emerge as consistent contributors to the origins of topics in this field, reflecting a sustained research presence. Notably, upper-middle-income (red) countries like China and Turkey also assert themselves as substantial contributors, adding depth to the global discourse on obesity and heart disease. Conversely, Sub-Saharan African and South Asian countries, predominantly classified as low- income (yellow) and lower-middle-income (green) nations, register the least contributions. This results in the region having the lowest number of topics originating from Sub-Saharan Africa and South Asia, indicating a relative underrepresentation in the discourse

Figure 3: Distribution and Origin of Terms per Topic from Obesity and Heart Disease Studies



Source: Author's Construct based on data from[37]
Note: Information on the content of the topics 1 to 15 is indicated in Table 1.

Table 2 depicts the counts of anthropometric indices, biomarkers and comorbidities included in obesity and heart disease studies. Thirty-four (34) anthropometric indices, thirty two (32) biomarkers and six (6) comorbidities were studied as part of obesity and heart disease research. There were, however, differences in the number of each group of indicators included in those studies. Again, among anthropometric indices, BMI, WHR, WC, NC, LBM, BFP and HC were among the most prevalent. BMI, WC, WHR, HC, LBM, BFP and NC were studied in 24322, 6748, 1232, 864, 461, 443 and 136 in works, respectively. Among the identified anthropometric indices, BMI was the most studied. Biomarkers such as lipoprotein, cholesterol, c-reactive protein (CRP), fasting plasma glucose, high-density lipoprotein (HDL) cholesterol, insulin, low-density lipoprotein (LPL), total cholesterol were the most studied. The indices such as cholesterol, c-reactive protein (CRP), fasting plasma glucose, high-density lipoprotein (HDL) cholesterol, insulin, low-density lipoprotein (LPL) lipoprotein and total cholesterol were found in 7796, 1838, 1658, 1273, 7238, 2990, 9239 and 3071 works, respectively. Diabetes, stroke, metabolic syndrome were the most prevalent comorbidities of obesity and heart disease studied. About 20756, 8124 and 3636 research papers studied diabetes/ diabetes mellitus /mellitus, metabolic syndrome and stroke, respectively.

Table 2: Number of Anthropometric Indices, Biomarkers and Comorbidities Studied as Part of Obesity and Heart Disease Research

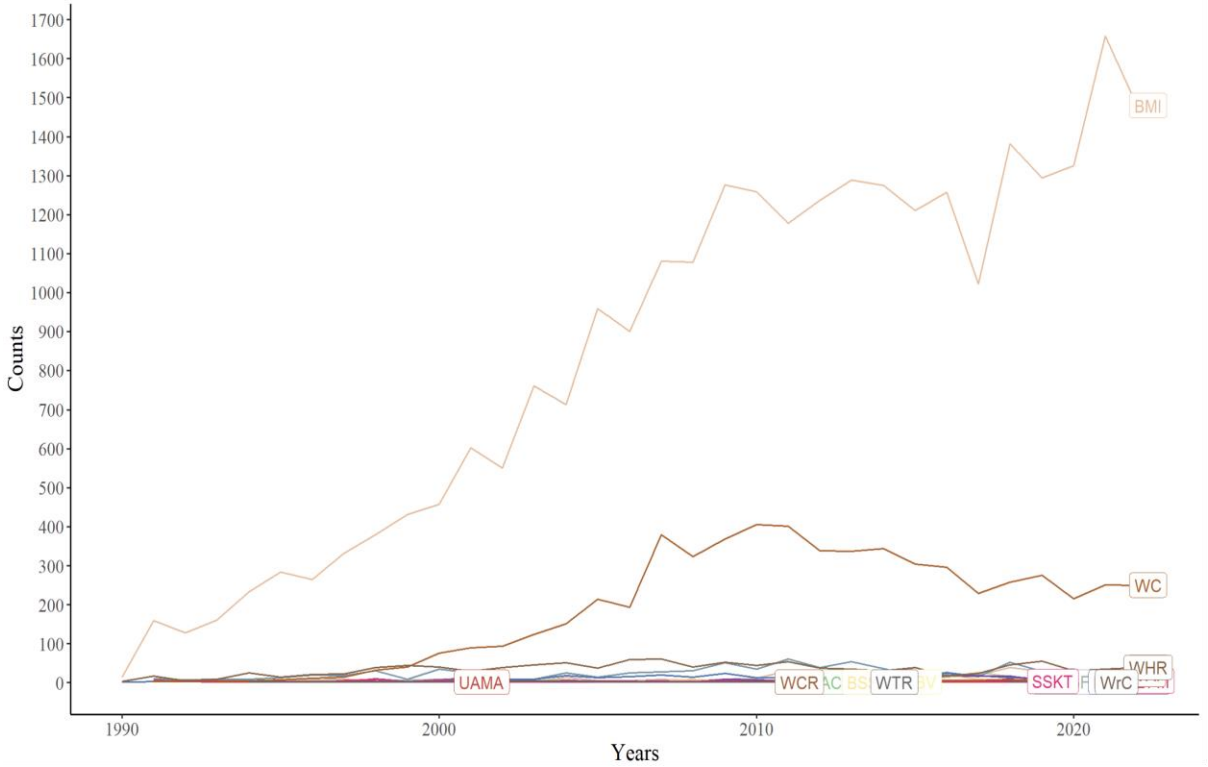
	Indicators Identified					
No.	**Anthropometric Index**	**Count**	**Biomarkers**	**Count**	**Comorbidities**	**Count**
1	ankle circumference (AC)	1	adiponectin	1111	atrial fibrillation	952
2	arm fat area (AFA)	10	apolipoprotein a1	126	depression and anxiety disorders	2
3	android fat distribution (AFD)	14	apolipoprotein b	604	diabetes/ diabetes mellitus /mellitus	20756
4	abdominal girth (AG)	18	brain natriuretic peptide (BNP)	313	metabolic syndrome	8124
5	arm muscle circumference (AMC)	12	cholesterol	7796	sleep apnea	834
6	body adiposity index (BAI)	48	c-reactive protein (CRP)	1838	stroke	3636
7	body density (BD)	4	fasting plasma glucose	1658		
8	body fat percentage (BFP)	443	fibrinogen	523		
9	body mass index (BMI)	24322	galectin-3	44		
10	basal metabolic rate (BMR)	38	growth differentiation factor 15 (GDF-15)	17		
11	body surface area (BSA)	164	glycated haemoglobin	217		
12	body shape index (BSI)	31	haemoglobin a1c (HBa1c)	692		
13	calf circumference (CC)	17	high-density lipoprotein (HDL)	1273		
14	chest circumference (CC)	4	high-sensitivity cardiac troponin t	15		
15	conicity index (CI)	99	insulin	7238		
16	hip circumference (HC)	864	interleukin-1 beta	28		
17	lean body mass (LBM)	461	interleukin-6	954		
18	mid-upper arm circumference (MUAC)	16	low-density lipoprotein (LPL)	2990		
19	neck circumference (NC)	136	lipoprotein	9239		
20	sagittal abdominal diameter (SAD)	59	matrix metalloproteinases	15		
21	skeletal muscle mass (SMM)	73	myeloperoxidase	31		
22	subscapular skinfold thickness (SSKT)	68	nt-probnp	326		
23	total body fat mass (TBFM)	45	resistin	237		
24	thigh circumference (TC)	30	soluble st2	15		
25	visceral adiposity index (VAI)	82	tnf-alpha	373		
26	waist circumference (WC)	6748	total cholesterol	3071		
27	waist-to-hip ratio (WHR)	1232	troponin	115		
28	waist-to-thigh ratio (WTR)	24	troponin i	45		
29	wrist circumference (WrC)	7	tumour necrosis factor-alpha	155		

Source: Author's Construct based on data from[37]

Figure 4 illustrates the trends in the distribution of anthropometric indices within obesity and heart disease studies spanning the years 1990 to 2022. Notably, there are discernible temporal variations in the prevalence of

different anthropometric indices. BMI and WC emerged as the most frequently utilised indices in the assessment of obesity and heart disease. Particularly noteworthy is the prevalence of BMI, which exhibited a frequency of use more than five times that of other anthropometric indices. A notable increase in the utilisation of both BMI and WC is observed between the years 2005 and 2019, reflecting their growing significance in obesity and heart disease research during this period.

Figure 4: Trends in Anthropometric Indices Employed in Obesity and Heart Disease Analysis from 1990 to 2020



In Figure 5, the representation of countries reflects their frequent integration of anthropometrics, biomarkers, and comorbidities in the examination of obesity and heart diseases. The size of each country, denoted by its abbreviation, corresponds to the frequency with which indices and morbidities are employed in obesity and heart diseases studies. Notably, variations in outcomes are evident among countries. Countries like the USA, China (CHN), England (ENG), Turkey (TUR), Iran (IRN), and Australia (AUS), among others, exhibit a higher frequency of utilising indices and morbidities in the investigation of obesity and heart disease compared to countries such as Ghana (GHA), Mozambique (MOZ), Uruguay (URY), and Nepal (NPL).

Figure 5: Word Cloud Depicting Countries Emphasising Anthropometrics, Biomarkers, and Comorbidities in the Examination of Obesity and Heart Diseases

Discussion

The paper provides an analysis of the literature on obesity and heart disease in the world. The analysis further enhances the understanding of the trends, topics, geospatial contributions in and to obesity and heart disease research. Using bibliometric approach and the PRISMA method and data retrieved from WOS, the study revealed several important insights.

The compelling insights derived from Figure 2 illuminate the dynamic trajectory of research endeavours surrounding obesity and heart disease from 1970 to 2022. The initial scarcity of studies, predominantly confined to North America and Europe, echoes the historical focus of these regions in health research. However, the pivotal juncture around 1990 signifies a paradigm shift, witnessing a substantial surge in research activities, especially within the mentioned regions. The current finding is unsurprising given the history of agencies and institutions of the US, Canada and European countries, in conducting and implementing health research, including other analogous academic health programmes[38-43].

Despite the escalating global interest in the subject, the sustained dominance of North America and Europe in scholarly contributions is evident. The dissemination of research influence expands beyond these regions to encompass Central Asia, East Asia, and the Pacific, indicating a broadening scope. In contrast, Sub-Saharan Africa and South Asia, while experiencing a gradual rise in research output, demonstrate a significant inflection point post-2015, reflecting a belated yet impactful engagement with the subject matter. This outcome serves as a clear call to action for developed countries to extend their support and promote research endeavours in the developing regions of the world. This is particularly crucial as there is an upsurge in the prevalence of obesity and heart disease, especially in Sub-Saharan Africa and Southeast Asia. In Sub-Saharan Africa alone, obesity is projected to cause 80,000,000 years of life loss within two decades, that is, 2040. Also, the end of this decade, countries in Sub-Saharan Africa and Southeast Asia will host about 75% and 80% all global hypertension and diabetes cases due to obesity. Consequently, the primary focus should be on encouraging developed nations to invest in and enhance research infrastructure[40,44,45], and initiate research networks with scientists in developed countries[45-47]. Obesity rates are on the rise in LMICs, impacting various indices including the widespread use of BMI as the main tool for screening health. This facilitates the surge in understanding obesity and use of specific user-friendly indices for its assessment[48]. The surge in obesity research is in parallel with several factors, including changing diets, economic transitions, socioeconomic disparities, and marketing influences. As a result, obesity research in LMICs aims to better understand these contributing factors and their impact on various indices. The shift in focus over the decades reflects not only the changing landscape of global health priorities but also highlights the imperative for a more inclusive and diversified approach in understanding and addressing these critical health issues worldwide[49,50].

The majority of studies reviewed focused on health factors and medical conditions and outcomes. These themes encompassed a wide range of topics related to population characteristics, health indices, comorbidities associated with obesity and heart diseases, as well as lifestyle and behavioural factors. The emphasis on health factors highlights the significance of understanding the various determinants of health[1] including the investigation of population characteristics such as age, sex, and demographics in general. The inclusivity of such determinants provide insights into the distribution and prevalence of obesity and heart diseases within different groups[51-53] in conjunction with the identification of populations at higher risk for obesity and heart disease to enable targeted interventions. Similarly, the inclusion of demographics as part of obesity and heart disease research reveals a shift from considering obesity and heart disease as individual challenges to recognising them as afflictions of population groups. This shift underscores the urgency in developing preventive strategies that can reach a larger number of people (Institute of Medicine (US) Committee on an Evidence Framework for Obesity Prevention Decision Making et al., 2010). Moreover, health indices played a crucial role in these studies, allowing researchers to assess and measure factors like body weight, body mass index (BMI), blood pressure, and lipid profiles. These indices serve as valuable markers for evaluating the health status and identifying potential risks associated with obesity and heart diseases[1,13,35,54]. It may also be speculated that the focus on biomarkers and anthropometric indices in research studies is due to the need to evaluate disease treatment efficacy. Assessing differing biomarkers and anthropometric indices for obesity and heart diseases can reveal the measures that are most effective for various populations' health assessment and treatment. This, in turn, provides a deeper understanding of the pathophysiology of obesity and heart diseases, paving the way for new discoveries and innovations in treatment and prevention[13,48].

Comorbidities, which refer to the simultaneous presence of multiple health conditions, were also explored extensively[55,56]. Incorporating obesity, disease markers, and comorbidities is crucial for understanding how obesity and heart diseases interact to exacerbate other conditions. These insights may reveal shared risk factors or underlying mechanisms driving the their cause and effect relationship, as well as the overall health consequences for individuals and population groups affected by both obesity and heart disease. Plus, that knowledge triggers the development of effective disease management strategies such that health care providers can better manage patients with both conditions when they perceive their confluence and potential complications[65]. Like the indicators above, lifestyle and behavioural factors emerged as important themes within literature. These encompassed aspects such as physical activity levels, dietary habits, smoking, and other behaviours that influence the development and progression of obesity and heart diseases. Investigating these factors helps in identifying modifiable risk factors and designing interventions to promote healthier lifestyles[57-63].

While the study has its strengths, it also has several limitations that should be acknowledged. Firstly, it was limited to conducting a bibliometric analysis of research output specifically related to obesity and heart diseases.

This narrow focus might exclude valuable research from other priority areas or fields that could contribute to a comprehensive understanding of the topic. Furthermore, the study relied on absolute numbers of publications retrieved and pre-defined search criteria to identify relevant studies. This approach could potentially overlook relevant research that might not meet the specific search criteria but could still offer valuable insights into obesity and heart diseases. It is important to note that these limitations are inherent to most bibliometric studies. The use of bibliometric analysis provides a quantitative overview of research output but may not capture the full breadth of research activities or account for variations in research quality or impact[64].

Conclusion

The study highlights the valuable insights provided by the identified research topics in the field of obesity and heart disease. It emphasises the importance of considering population characteristics, health assessment, comorbidities, and lifestyle factors when addressing these conditions. Taking a holistic approach is crucial for developing comprehensive strategies that effectively tackle the complexity of obesity and heart disease. The study suggests that leveraging the findings can aid policymakers, healthcare professionals, and researchers in prioritizing evidence-based interventions and collaborations to mitigate the burden of obesity and heart disease. Continued research, international cooperation, and interdisciplinary efforts are deemed essential to develop effective prevention and intervention strategies, especially in regions with limited research activity. Addressing obesity and heart disease requires a multifaceted approach that includes education, policy changes, improvement in healthcare systems, and community engagement. Working together, it is concluded that we strive towards a healthier future and reduce the impact of obesity and heart disease on individuals, communities, and societies as a whole.

Declarations

ETHICS APPROVAL AND CONSENT TO PARTICIPATE
Not Applicable

CONFLICTS OF INTERESTS
The authors declare that there are no competing interests.

FUNDING
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AUTHOR'S CONTRIBUTIONS
SSS conceived the study.
SSS and JEH drafted the manuscript.
SSS, JEH, MSS, and TS read, and approved intellectual content of the final manuscript.

DATA AVAILABILITY
The data used for the study is available at:
https://www.webofscience.com/wos/woscc/summary/384a3c0c-6fcc-4e74-923c-073f010d110a-83d6191c/relevance/1(overlay:export/exc)

Appendix

Table 1: Anthropometric indices, biomarkers and comorbidities to be identified

Index Name	**Abbreviation**		
Anthropometric Indices			
Arm muscle circumference	AMC	Weight	
Arm fat area	AFA	Waist circumference	WC
Body density	BD	Waist-to-hip ratio	WCR
Bone density	BD*	Waist-to-height ratio	WHR
Basal metabolic rate	BMR	Waist-to-hip-to-thigh ratio	WHTHR
Body surface area	BSS	Waist-to-hip-to-trunk ratio	WHTR
Blood volume	BV	Waist-to-thigh ratio	WTR
Bone mineral content	BMC	Cardiovascular fitness	-
Bone mineral density	BMD	Energy expenditure	-
Chest circumference	CC	Fat-free mass	FFM
Chest-to-hip ratio	CHR	Flexibility indices	-
Calf circumference	CL	Grip strength-to-body weight ratio	-
Elbow breadth	EB	Height	-
Gluteofemoral fat mass	GFD	Lung function indices	-
Hip circumference	HC	Mid-upper arm circumference	MUAC
Hip-to-height ratio	HHR	Neck circumference	NC
Knee breadth	KB	Respiratory quotient	-
Lean body mass	LBM	Skinfold thickness measurements	-
Skeletal muscle mass	SMM	Subscapular-to-triceps skinfold ratio	-
Standing height	STR	Subscapular skinfold thickness	-
Thigh circumference	TC	Triceps skinfold thickness	-
Thigh-to-calf ratio	TCR	Upper body segment length	-
Trunk length	TL		

Index Name	Abbreviation		
Biomarkers			
C-reactive protein	CRP	Matrix metalloproteinases	MMPs
Natriuretic peptides	-	Soluble ST2	sST2
B-type natriuretic peptide	BNP	Growth differentiation factor 15	GDF-15
N-terminal pro-B-type natriuretic peptide	NT-proBNP	Homocysteine	-
Troponin	-	Myeloperoxidase	-
High-sensitivity cardiac troponin T	-	Galectin-3	-
Troponin I	-	Fibrinogen	-
HbA1c	-	Comorbidities	
Glycated hemoglobin	-	Hypertension	
Fasting plasma glucose/ Fasting blood glucose	FPG	Diabetes mellitus	
Insulin	-	Hyperlipidemia	
Lipoprotein	LP	Obesity	
Triglycerides	-	Coronary artery disease	
Cholesterol	-	Stroke	
Total cholesterol	-	Peripheral arterial disease	
LDL cholesterol	LDL	Chronic kidney disease	
HDL cholesterol	HDL	Chronic obstructive pulmonary disease	
Apolipoprotein B	ApoB	Heart failure	
Apolipoprotein A1	ApoA1	Atrial fibrillation	
Adiponectin	-	Valvular heart disease	
Resistin	-	Arrhythmias	
Tumor necrosis factor-alpha	TNF-alpha	Metabolic syndrome	
Interleukin-6	IL-6	Sleep apnea	
Interleukin-1 beta	IL-1β		

Source: Authors' Construct

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