

REVIEW

Determinants of overweight and obesity and preventive strategies in Pacific countries: a systematic review

Tanebu Julia Tong^a, Masoud Mohammadnezhad^{b,*}, Nasser Salem Alqahtani^c^a Ministry of Health and Medical Services, Tarawa 487, Kiribati^b Faculty of Health Studies, School of Nursing and Healthcare Leadership, University of Bradford, Bradford, West Yorkshire BD7 1DP, United Kingdom^c Department of Clinical Nutrition, Northern Border University, Arar 1321, Saudi Arabia

ARTICLE INFO

Article history:

Received 4 March 2022

Received in revised form 6 May 2022

Accepted 27 June 2022

Available online 7 July 2022

Keywords:

Determinants

Preventative strategies

Overweight

Obesity

Pacific

Systematic review

ABSTRACT

Objective: This study aimed to explore more on contributing factors and prevention of overweight and obesity among Pacific islanders.

Methods: Using Cochrane library guideline, four electronic databases, PubMed, Embase, Scopus and CINAHL, were systematically searched from 2010 to 2020. Search strategy included key concepts, free text terms, and database-controlled vocabulary terms to identify articles on determinants and preventative strategies of overweight and obesity in the Pacific countries. A data extraction sheet was developed to extract relevant information required for analysis and theme development for this study.

Results: A total of 22 articles were summarized and categorized. Determinants of overweight and obesity identified two themes: environmental related factors 13.6% (3/22) and sociocultural related factors 27.3% (6/22). The preventative strategies of overweight and obesity was categorized into behavioural change 22.7% (5/22), school-related 18.2% (4/22), and policies 50% (11/22). The quality assessment of articles showed “Good” 68.2% (15/22), and “Fair” 31.8% (7/22).

Conclusion: This study highlighted two contributing, non-medication factors affecting overweight and obesity are both environmental and socio-cultural issues. Overweight and obesity preventative strategies identified in the Pacific context considered behavioural change, knowledge enhancement, and policy development. Further research should aim at exploring the current preventative strategies in-depth, to appreciate the most feasible and recommended preventative approach within the Pacific society.

1. Introduction

Overweight and obesity is a major issue that has tripled in the past 30 years,¹ across the globe and affects the growth and development of society. World Health Organization (WHO) states that people living in high-income countries had high cases of overweight and obesity in between 1975 and 2019. The global prevalence and incidence of obesity among the adult age group has increased from 29.8% to 38.0% among women and 28.8% to 36.9% among men between 1980s and 2018.² However, in 2020, a report of more than 340 million Pacific Island children below 19 years of age in low and middle-income countries were also faced with challenges of overweight and obesity.³ In Vanuatu, 12.0% and 0.4% were overweight and obese while Tonga, 58.7% and 21.1% were reported overweight and obese respectively.⁴

Much research has reported the determinants of overweight and obesity in different countries, among different age groups of society.⁵ Overweight and obesity among Pacific islanders is caused by multifactorial

conditions such as gender, genetics, and high birth weight that interplay with the environment or lifestyle patterns such as a lack of physical activity and unhealthy eating patterns, thus resulting in excess energy intake, or a combination of the two resulting in energy excess.⁶⁻⁷ Furthermore, the genetics and social factors including prolonged screen time, low socioeconomic background,⁸ and accessibility of junk food⁹ items that collectively or independently causes imbalance between food consumption and energy expenditure. Moreover, frequent use of transportation, having limited knowledge, and modest behavioural lifestyle further contributes to weight gain from different angles. Consequently, studies confirmed that weight stigma, low self-esteem, and psychological issue exist among Pacific Islanders at a young age and progresses into an increased rate of premature deaths and disability among the adult population.¹⁰⁻¹¹

Overweight and obesity causes many physical and psychological health challenges and therefore affecting the wellbeing of an individual.¹² For instance, a developed nation such as the United States (US)

* Corresponding author: masraqo@hotmail.com.

used to focus on malnutrition, however, obesity and overweight has become an uprising issue due to the change of nutrition, inactivity, and lifestyle. This has led to impacts such as premature deaths, non-communicable diseases (NCDs) and disabilities globally, whereby according to WHO 2019 report, 7 out of 10 causes of deaths and disabilities worldwide are related to obesity and overweight.¹³

From WHO 2016 data, an estimated 43.0% of adults in the Pacific Islands Countries (PICs) are obese and overweight, which is more than triple the global average, and with NCDs reaching crisis levels.¹⁴ The PICs are group of islands scattered across the vast Pacific Ocean and is designated into three regions: Polynesia, Melanesia, and Micronesia. Global statistics from WHO reported that nine PICs out of the top ten countries had the highest prevalence of obesity globally with concerning countries being Palau (47.6%), Nauru (45.6%), the Marshall Islands (42.8%), Kiribati (40.6%), Tuvalu (40.3%), Samoa (43.4%), Tonga (43.3%), the Cook Islands (50.8%), and Niue (43.2%).¹⁵ At present, overweight and obesity is now a growing concern especially among developing PICs where physical inactivity¹⁶ and changes in diet¹⁷ are responsible for the dramatic increase in obesity.

Due to the geographical location of islands scattered across the vast Pacific Ocean, in addition to being under-developed and developing nations with limited resources, and populated with diverse cultural backgrounds, determinants of overweight and obesity in the Pacific are complex. Overweight and obesity is the major issue in the Pacific region,¹⁸ where most of its population is facing the consequences leading to the high risk of decrease life expectancy and poor management within the health sector.¹⁹ Further insights and statistics on this issue will necessitate appropriate strategic measures for health improvements however, there are lack of studies done within the Pacific Island countries concerning this issue.²⁰

Since overweight and obesity in the Pacific is on the rise and affecting all generations with different complications.²¹ Therefore, identifying the factors contributing to overweight and obesity can reveal a new perspective. Furthermore, exploring these key factors of overweight and obesity among the Pacific society will identify the gaps essential for policy development and cultural behavioural change that would require a holistic whole-of-government approach with societal understanding and participation.²²

2. Data and methodology

This research study used Cochrane methodical review guideline and PRISMA checklist to scrutinize the scope of numerous published articles based on determinants and preventative strategies of overweight and obesity in the Pacific countries. Different electronic databases such as PubMed, Scopus, Embase, and CINAHL showed many studies concerning

overweight and obesity and thus useful for the search of meaningful articles. Inclusion criteria involve studies with full text of any design relating to determinants and preventative strategies of overweight and obesity and showing interest in the Pacific society and environment; and published between 2010 and 2022. Exclusion criteria will be brief reports, abstracts, research news, non-English published articles, and those articles reporting genetic factors

2.1. Search strategy

Given the impression that only few articles relating to overweight and obesity in the Pacific countries are published, scrutinizing articles around the region dating from 2010 will be done, with accessible full text and key concepts “determinants and preventative strategies”, “overweight and obesity”, “Pacific Islands”, and “systematic reviews”. According to PICO model, **Table 1** was developed to assist in the search for relevant studies for use (**Fig. 1**). Further use of controlled vocabulary terms/ subject terms in different databases used showed concept 1, concept 2, concept 3, and concept 4 as follow: CINAHL (89, 131, 12, 307), PubMed (10, 16, 11, 25), Scopus (5 682, 5 145, 1 005, 5 368), and Embase (65, 39, 35, 204) respectively. Furthermore, Boolean AND and OR were used to expand the search limits.

2.2. Selection process

Keywords in this systematic review identified articles from databases PubMed, Embase, Scopus, and CINAHL. Citations of articles identified were entered into Excel template to screen articles found according to title, year, and author fields. The selection process further removed duplicated articles and those not done in the Pacific. A list of shortlisted articles’ title and abstract were recorded in Excel template according to author, year, title, and abstract with two extra columns for reviewers’ decision whether “yes or maybe”, include or “no”, exclude article in relevancy to study title. Both decisions from reviewer will be compared and any discrepancies were resolved in a discussion to prevent biasness. The full texts of all remained studies labelled “maybe” were read for full details to conclude its relevance to this systematic study.

A data extraction sheet was developed to extract relevant information required for analysis and theme development for this study (**Table 2**).

3. Results

Studies in the Pacific region were scarce and thus all data extracted for this review comprise of studies published in the last ten years. **Table 3**

Table 1
Search strategy.

Item	Concept 1	Concept 2	Concept 3	Concept 4
Key concepts	Determinants and preventative strategies	Overweight and obesity	Pacific Islands	Systematic review
Free text terms/natural language terms	Preventive measures, causes, treatments, factors, plans, policies, approaches	Heavy, obese, overweightness	Oceania, Pacific Island Countries, Fiji, Kiribati, Solomon Islands, Vanuatu, Tonga, Samoa, Cook Islands, Marshall Islands, Nauru, Micronesia, Tahiti, Tuvalu, Papua New Guinea, Palau, Niue, Pacific countries	Journal, appraisal, study, research
Database (Controlled vocabulary terms/Subject terms) = result	CINAHL (MeSH/Subject headings not exploded) = 89 PubMed (MeSH Headings not exploded) = 10 Scopus (IndexTerms) = 5 682 Embase (Emtree not exploded) = 65	CINAHL (MeSH/Subject headings not exploded) = 131 PubMed (MeSH Headings not exploded) = 16 Scopus (IndexTerms) = 5 145 Embase (Emtree not exploded) = 39	CINAHL (MeSH/Subject headings not exploded) = 12 PubMed (MeSH Headings not exploded) = 11 Scopus (IndexTerms) = 1 005 Embase (Emtree not exploded) = 35	CINAHL (MeSH/Subject Headings not exploded) = 307 PubMed (MeSH Headings not exploded) = 25 Scopus (IndexTerms) = 5 368 Embase (Emtree not exploded) = 204

Table 2
Data extraction sheet.

Study information (first author, publication year, country and region)	Objective	Participants	Study design	Results	Quality assessment tool
Hendriks AM, 2015, Fiji ²³	To describe the shape of the wider obesity prevention policy landscape	15 representatives from 9 ministries within Fiji National Government	Qualitative study	Poor economic situation, low Food Self-sufficiency, framing of obesity, power inequalities, lack of evidence, limited resource sharing, window of opportunity, inter-sectoral governance structures	Good
Douglas JA, 2016, Asia-Pacific ²⁴	To inform individual organizational, and community empowerment	2 community-based organizations participating in Robert Wood Johnson Foundation's Communities Creating Healthy Environments	Mixed method	Offer compelling evidence for: (1) identifying proximal and distal determinants of public health disparities; and (2) empowering communities to directly redress these inequities	Fair
Fialkowski MK, 2013, US Affiliated Pacific Islands, Hawaii, and Alaska ²⁵	To describe the community engagement process; to report community-identified priorities; to share lessons learned in the CEP	Four communities in each of five Children's Healthy Living jurisdictions with over 900 community members	Qualitative study	Environmental intervention strategies	Good
Hardin J, 2018, Samoa, Nauru ²⁶	Relationship between intervention and body change	Nauru and Samoa clinical setting	Qualitative study	Determinants Interventions	Good
Cyril S, 2016, Victoria Australia ²⁷	To explore service providers' perceptions of the key factors influencing the participation of culturally and linguistically diverse (CALD) communities	59 service providers from CALD groups living in four socioeconomically disadvantaged areas	Qualitative study	Community-level barriers to CALD	Good
Seear K, 2019, Western Australia ²⁸	To identify how and why some lifestyle changes improve health	About 3,300 Aboriginal people from Northwest Australia	Qualitative study	Potential diabetes complications The difficulty of change	Good
Snowdon W, 2013, Pacific Islands ²⁹	To document challenges; to identify trade agreements contributing	Pacific Island's trade policy	Obesity reviews: surveillance and evaluation	Improve food supply-innovation Trade agreement-limit policy	Fair
Dodd R, 2020, Pacific ³⁰	To understand regional priorities and policy development; to identify opportunities for progress.	Documents from a decade of regional meetings	Analytical study	The proposed policies	Good
Pescud M, 2019, Australia ³¹	To explore the public policy attention	33 stakeholders within Australia	Qualitative study	Healthy Weight Initiative	Good
Nusair P, 2015, Fiji ³²	To understand the prevalence of overweight and obesity	2 203 mothers	Quantitative study	Determinants and prevention	Good
Kessaram T, 2015, Pacific Islands ³³	To synthesise available data on overweight, obesity and their risk	Results of 2 cross-sectional surveys	Article reviews	Determinants and prevention	Fair
Brouwers CFS, 2016, Pacific Island Countries ³⁴	To gain insight; to examine the model Nutrition transition	Literature about obesity and nutrition transition in the Pacific	Literature review	Determinants of obesity in the Pacific	Fair
Thompson-McCormick JJ, 2014, Fiji ³⁵	To assess the prevalence of overweight, obesity, and breakfast skipping	523 school-going girls	Quantitative study	Determinants-skipping breakfast	Good
Fox A, 2019, Pacific Island countries ³⁶	To evaluate economic globalization versus economic development	Cross-national longitudinal dataset	Quantitative study	Determinants	Good
Ravuvu A, 2020, Pacific ³⁷	To highlight and monitor obesity across the Pacific region	Literature on childhood obesity across the Pacific	Literature review	Global protocol	Fair
Tong TJ, 2022, Kiribati ³⁸	To determine factors contributing to overweight and obesity	32 students	Qualitative Study	Determinants	Good
Haddad L, 2014, Asia and the Pacific ³⁹	To review the trend and consequences of obesity	9 countries in Asia and the Pacific	Literature review	Prevention	Fair
Wate JT, 2013, Fiji ⁴⁰	To identify the dietary patterns of adolescents	6 871 adolescents	Qualitative study	Preventative strategies	Good
Foster N, 2018, Pacific ⁴¹	To understand the extent to which these three diet-related regulatory interventions; to highlight challenges and opportunities	6 countries: Barbados, Dominica, Jamaica, Fiji, Nauru, Tonga	Review	Policy implementation	Good
Galy O, 2019, Pacific ⁴²	To investigate technology-based educational program; to create insightful data analysis methods	24 adolescents	Exploratory Quantitative study	Determinants Policies	Good
Latu C, 2018, Fiji ⁴³	To provide an in-depth examination of barriers	7 food-related policies	Case studies	Policies	Good
Cassels S, 2006, Micronesia ⁴⁴	To outline foreign rule and social trade; to highlight the Pacific tuna trade		Case studies	Traditional food and healthy lifestyle determinants	Fair

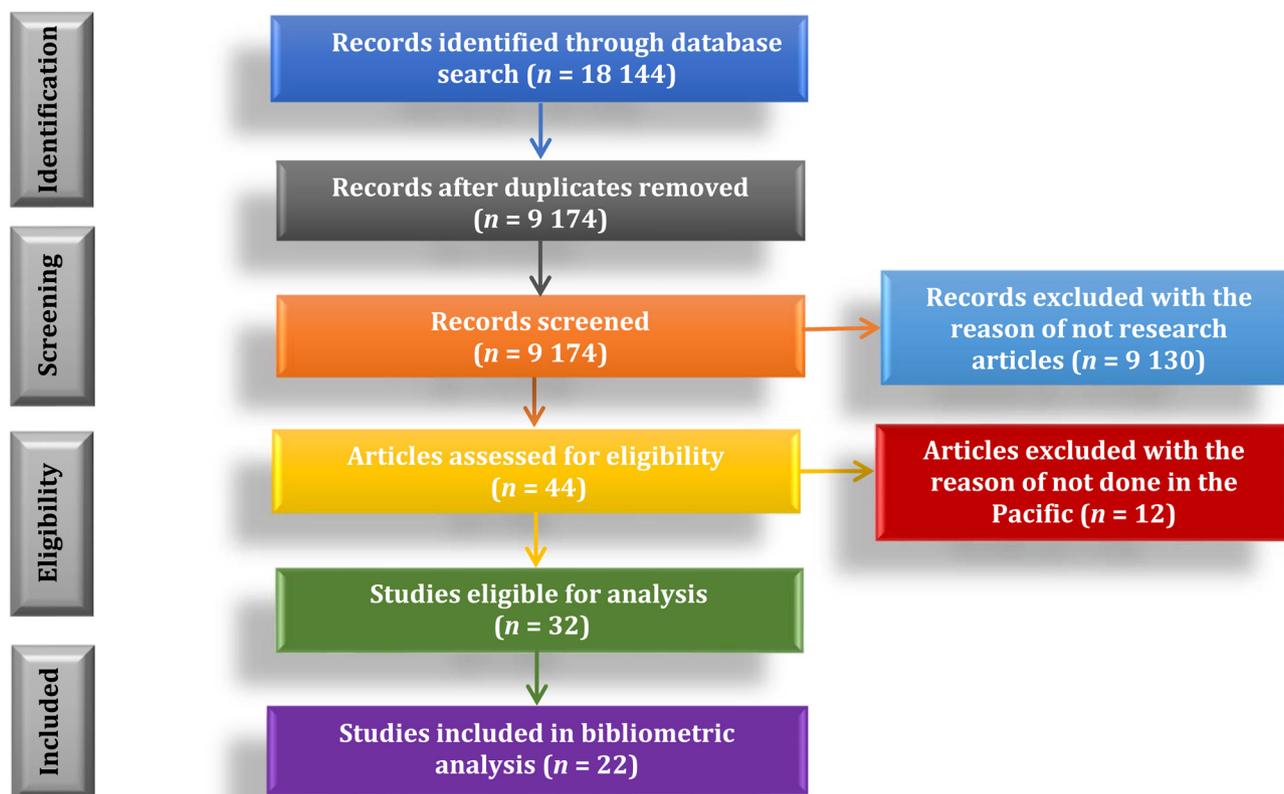


Fig. 1. Process of selection.

Table 3
General Characteristics of studies.

Variable	n (%)
Types of studies	
Case	2 (9.0)
Qualitative	8 (36.4)
Quantitative	4 (18.2)
Mixed method	1 (4.0)
Reviews	6 (27.0)
Analytical	1 (4.0)
Settings	
Pacific region	11 (50.0)
Fiji	5 (22.7)
Australia	3 (13.6)
Kiribati	1 (0.05)
Micronesia	1 (0.05)
Samoa & Nauru	1 (0.05)
Quality assessment	
Good	15 (68.2)
Fair	7 (31.8)

shows that most studies ($n = 8$) were qualitative studies with several reviews ($n = 6$) also available. Quantitative ($n = 4$), mixed method ($n = 1$), Analytical ($n = 1$), and case studies ($n = 2$) were also included. The study settings selected involved the Pacific Island communities ($n = 11$), with more specific articles reported from Fiji ($n = 5$), Australia ($n = 3$), Kiribati ($n = 1$), Federate States of Micronesia ($n = 1$), and a study involving both Samoa and Nauru ($n = 1$).

Determinants of overweight and obesity identified from the studies were socioeconomic status ($n = 4$), demographics ($n = 7$), diet ($n = 9$), physical inactivity ($n = 9$), stress ($n = 3$), poor sleep ($n = 3$) and thus categorized into two themes: environmental related factors ($n = 9$) and

socio-cultural related factors ($n = 13$). The preventative strategies of overweight and obesity as gathered from the studies were implementation of school curriculum ($n = 3$), exploring feasible policies ($n = 6$), choosing healthier foods ($n = 5$), modifying trade agreement on food ($n = 4$), and physical exercise ($n = 4$) thus was categorized into behavioural change ($n = 9$), school-related ($n = 3$), and policies ($n = 10$). The quality of each study included in this review was checked using checklists from the University of Tasmania quality assessment checklist and showed 68.2% rating “Good” where no important limitations were detected, and 27.3% rating fair where some uncertainty on conclusions require full text to reconsider.

Looking at the determinants of overweight and obesity in the Pacific society, missing breakfast was one behavioural determinant of overweight and obesity reported among the Fijian population. Several studies from Fiji reported on obesity determinants and prevention through public health and policy development. Poor economic situations, low food self-sufficiency, limited resources, and power inequalities were among the reported barriers to implementation of developed policies with the need to strengthen collaboration between sectors at government and national level. Another study looked at overweight and obesity among pregnant women in Fiji as an urgent health issue that requires more feasible interventional programs.

The preventative measures and body norms of people from Samoa and Nauru was also surveyed. The findings concluded that obesity interventions in the Pacific society fail because they re-shape body norms intensely in a way that creates confusion between the intended purpose and repetitious body norms. Another study explored the use of fitness trackers and smart pedometers to improve behaviour towards physical activity among the adolescents age group. Results showed that least active adolescents adhered to daily consistency of physical activities and increased participation in the physical activity program.

Among the preventative strategies on overweight and obesity obtained from this systematic review, case studies on policies were also reviewed. At the national level of prevention, leaders were identified as not being supportive of progressing policies. The study concluded the need for leaders across the Pacific to collaborate with stakeholders to enhance implementation of developed policies.

4. Discussion

Overweight and obesity is a global health issue that requires whole-of-people-government approach. Although preventative strategies have been developed, it is still a chronic issue in developed countries that has now invaded the Pacific Island countries. The aim of this study is to identify determinants of overweight and obesity in the Pacific and explore the preventative strategies developed.

This systematic review focused on the modifiable factors of overweight and obesity as preventative strategies are exploring the personal, interpersonal and community levels of the Pacific society. Therefore, in this systemic review, results illustrated that determinant of overweight and obesity among Pacific islanders are environmental related and socio-cultural related. In environmental related factors several identified studies used^{23,32,34,36,38} reported socio-economic status, existing policies and programs, school curriculum and policies, and limited resources as common determinants of overweight and obesity. In socio-cultural factors, several determinants obtained from studies reviewed were nutritional transition, physical inactivity, peer pressure, and local body norms.

Socio-cultural related factors focus on diet and physical education, psychosocial, and cultural related factors. Nutrition of many Pacific Islanders is associated with urbanization. In rural areas, diet is more dependent on local plantation and traditional nutritious food. However, urbanization introduces western diet such as processed energy-dense food, sweets, refined grains, and fat.⁴⁵ Furthermore, the cultural perception in serving size and addictive taste of processed food adds on to the unhealthy diet behaviour. Food preparation of sodium rich, oily, and sweetened diet are common taste of Pacific Islanders, whereas fruits and vegetables are rarely seen as part of meal menus.⁴⁶ Nutritional status of Pacific Islanders is reported as a concern and open opportunity for progression to overweight and obesity.⁴⁷

Physical activity is another factor crucial in ensuring good health and well-being of an individual. The cause of overweight and obesity is believed to be due to high food consumption and physical inactivity.⁴⁸ Therefore, as studies highlighted, physical activity of 30–60 minutes per day is required to prevent overweight and obesity among all ages.⁴⁹

Compared to other articles, western lifestyle introduced through urbanization has been the focus of attention within the public health setting because it impacts individual health.⁵⁰ Global statistics of 2007 show that more than 50.0% of the world's population are living or have moved to urban areas.⁵¹ The increase as estimated by WHO would be at 10.0% every 20 years. Pacific Islanders exposed to western lifestyles early in life are more dependent on sedentary lifestyles rather than attained cultural skills and routines.⁵² The combined effects of living environment imported goods, and transportation use, significantly influence and determined a high risk for overweight and obesity development and complications.⁵³

Identified factors relating to school curriculum and policies is rather limited. However, school prospectus, policies are important. Policies are aimed at preventing overweight and obesity among Pacific islanders through education and health. As reviewed in articles, developing new and feasible health and educational policies in the Pacific Island Countries will promote healthier lifestyles and expose the younger generation to healthier environments.⁵⁴ Since determinants of overweight and obesity are vast, the development of preventative strategies requires identification and understanding of specific factors

that can be addressed by developed plans. This systemic review has identified environmental related and socio-economic related factors as determinants and thus preventative policies should focus on these factors.

Preventative strategies identified from this systematic review were aiming at community and government levels of prevention. As mentioned in one article⁴³ leaders require collaboration to maintain policies. Also stated, communities need to redress disparities within the public health that has caused dilemma between determinants of overweight and obesity.²⁴

There are many factors that influence the development of overweight and obesity among Pacific islanders.⁵⁵ Therefore, prevention and treatment would require multiple activities and group approach. Since learning begins at a young age, strategies should be developed and build around school related environment. Health and physical education, School food policies, and access to drinking water in school are reported to being effective.⁵⁶ These approaches are feasible, cost-effective, and influential to students in school-based interventions.

However, a wider strategy with more teamwork approach to prevention is in community-based programs. Swinburn BA et al. reported the use of Obesity Prevention in Communities around the Pacific region.⁵⁷ The two main goals for such program are capacity building in communities and healthy weight promotion. This program has reached some Pacific Island countries like Tonga and Fiji, including Australia, and New Zealand and therefore ongoing and progression of such program require leadership collaboration.

5. Conclusion

The study has synthesized the findings of 22 articles. The determinants of overweight and obesity has been categorized into environmental related and socio-cultural related factors. The non-pharmacological programs available are behavioural lifestyle change, and school curriculum review, and health and education policy development aiming individuals, community, and the Pacific islanders at large. However, the majority ($n = 21$) of articles reviewed were published after 2010 thus more research in overweight and obesity is needed in the Pacific to keep information and data updated. The limitations of this study however were omissions of articles without open access to full texts and those not published in English language.

Acknowledgements

The author acknowledges the assistance received from reviewer who have significantly contributed to restructuring the final draft of this paper through insightful comments.

CRediT author statement

Tanebu Julia Tong: Conceptualization, Data curation, Project administration, Validation, Formal analysis, Writing—Original draft. **Masoud Mohammadnezhad:** Conceptualization, Methodology, Writing—Review & Editing, Supervision. **Nasser Salem Alqahtani:** Methodology, Supervision.

Availability of data and materials

The data and materials can be made available upon request to corresponding author.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. *Int J Pediatr Obes*. 2006;1(1):11-25. doi:10.1080/17477160600586747.
- Ng M, Fleming T, Robinson M, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2014;384(9945):766-781. doi:10.1016/S0140-6736(14)60460-8.
- Obesity and overweight. World Health Organization website. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>. Accessed March 23, 2022.
- Pengpid S, Peltzer K. Overweight and obesity and associated factors among school-aged adolescents in six Pacific Island Countries in Oceania. *Int J Environ Res Public Health*. 2015;12(11):14505-14518. doi:10.3390/ijerph12111450.
- Monasta L, Batty GD, Cattaneo A, et al. Early-life determinants of overweight and obesity: a review of systematic reviews. *Obes Rev*. 2010;11(10):695-708. doi:10.1111/j.1467-789X.2010.00735.x.
- Güngör NK. Overweight and obesity in children and adolescents. *J Clin Res Pediatr Endocrinol*. 2014;6(3):129-143. doi:10.4274/Jcrpe.1471.
- Kumanyika SK, Obarzanek E, Stettler N, et al. Population-based prevention of obesity: the need for comprehensive promotion of healthful eating, physical activity, and energy balance: a scientific statement from American Heart Association Council on Epidemiology and Prevention, Interdisciplinary Committee for Prevention (formerly the expert panel on population and prevention science). *Circulation*. 2008;118(4):428-464. doi:10.1161/CIRCULATIONAHA.108.189702.
- Martinovic M, Belojevic G, Evans GW, et al. Prevalence of and contributing factors for overweight and obesity among Montenegrin schoolchildren. *Eur J Public Health*. 2015;25(5):833-839. doi:10.1093/eurpub/ckv071.
- Davis B, Carpenter C. Proximity of fast-food restaurants to schools and adolescent obesity. *Am J Public Health*. 2009;99(3):505-510. doi:10.2105/ajph.2008.137638.
- Kyrou I, Randeava HS, Tsigos C, et al. Clinical problems caused by obesity. In: Feingold KR, Anawalt B, Boyce A, et al., eds. *Endotext*. South Dartmouth (MA): MDText.com, Inc; 2000.
- McCormack LA, Laska MN, Gray C, Veblen-Mortenson S, Barr-Anderson D, Story M. Weight-related teasing in a racially diverse sample of sixth-grade children. *J Am Diet Assoc*. 2011;111(3):431-436. doi:10.1016/j.jada.2010.11.021.
- Shaw K, O'Rourke P, Del Mar C, Kenardy J. Psychological interventions for overweight or obesity. *Cochrane Database Syst Rev*. 2005;2:CD003818. doi:10.1002/14651858.CD003818.pub2.
- Preventing noncommunicable diseases. World Health Organization website. <https://www.who.int/activities/preventing-noncommunicable-diseases>. Accessed February 13, 2022.
- Saha A, Alleyne G. Recognizing noncommunicable diseases as a global health security threat. *Bull World Health Organ*. 2018;96(11):792-793. doi:10.2471/blt.17.205732.
- Obesity. World Health Organization website. <http://www.who.int/topics/obesity/en/>. Accessed April 23, 2022.
- Workshop on obesity prevention and control strategies in the Pacific, Apia, Samoa, 26–29 September 2000: report. World Health Organization website. <https://apps.who.int/iris/handle/10665/207977?show=full>. Accessed May 19, 2022.
- Climate change and food security in Pacific Island Countries. Reliefweb website. <https://reliefweb.int/report/world/climate-change-and-food-security-pacific-island-countries>. Accessed May 19, 2022.
- World Health Organization. Prevalence of obesity, ages 18+, 2010–2014 (age standardized estimate). http://gamapserver.who.int/gho/interactive_charts/ncd/risk_factors/obesity/atlas.html. Accessed May 19, 2022.
- Gill T. Epidemiology and health impact of obesity: an Asia Pacific perspective. *Asia Pac J Clin Nutr*. 2006;15(Suppl):3-14.
- O'Dea JA. Gender, ethnicity, culture and social class influences on childhood obesity among Australian schoolchildren: implications for treatment, prevention and community education. *Health Soc Care Community*. 2008;16(3):282-290. doi:10.1111/j.1365-2524.2008.00768.x.
- Obesity: preventing and managing the global epidemic. Report of a WHO consultation. *World Health Organ Tech Rep Ser*. 2000;894:i-253.
- Below the surface: law and the roots of obesity in the Pacific. McCabe Centre for Law and Cancer website. <https://www.mccabecentre.org/news-and-updates/below-the-surface-law-and-the-roots-of-obesity-in-the-pacific.html>. Accessed March 23, 2022.
- Hendriks AM, Delai MY, Thow AM, et al. Perspectives of Fijian policymakers on the obesity prevention policy landscape. *BioMed Res Int*. 2015;2015:926159. doi:10.1155/2015/926159.
- Douglas JA, Grills CT, Villanueva S, Subica AM. Empowerment praxis: community organizing to redress systemic health disparities. *Am J Community Psychol*. 2016;58(3-4):488-498. doi:10.1002/ajcp.12101.
- Fialkowski MK, DeBaryshe B, Bersamin A, et al. A community engagement process identifies environmental priorities to prevent early childhood obesity: the Children's Healthy Living (CHL) program for remote underserved populations in the US Affiliated Pacific Islands, Hawaii and Alaska. *Matern Child Health J*. 2013;18(10):2261-2274. doi:10.1007/s10995-013-1353-3.
- Hardin J, McLennan AK, Brewis A. Body size, body norms and some unintended consequences of obesity intervention in the Pacific Islands. *Ann Hum Biol*. 2018;45(3):285-294. doi:10.1080/03014460.2018.1459838.
- Cyril S, Green J, Nicholson JM, Agho K, Renzaho AMN. Exploring service providers' perspectives in improving childhood obesity prevention among CALD Communities in Victoria, Australia. *PLoS One*. 2016;11(10):e0162184. doi:10.1371/journal.pone.0162184.
- Seear K, Lelievre M, Atkinson D, Marley J. "It's important to make changes." Insights about motivators and enablers of healthy lifestyle modification from young aboriginal men in Western Australia. *Int J Environ Res Public Health*. 2019;16(6):1063. doi:10.3390/ijerph16061063.
- Snowdon W, Thow AM. Trade policy and obesity prevention: challenges and innovation in the Pacific Islands. *Obes Rev*. 2013;14:150-158. doi:10.1111/obr.12090.
- Dodd R, Reeve E, Sparks E, et al. The politics of food in the Pacific: coherence and tension in regional policies on nutrition, the food environment and non-communicable diseases. *Public Health Nutr*. 2019;23(1):168-180. doi:10.1017/s1368980019002118.
- Pescud M, Sargent G, Kelly P, Friel S. How does whole of government action address inequities in obesity? A case study from Australia. *Int J Equity Health*. 2019;18(1):8. doi:10.1186/s12939-019-0913-6.
- Nusair P. Prevalence and determinants of overweight and obesity among pregnant women attending the Colonial War Memorial Hospital (CWMH) antenatal clinic, Suva, Fiji Islands, 2015. *MOJ Public Health*. 2017;6(4):367-371. doi:10.15406/mojph.2017.06.00177.
- Kessaram T, McKenzie J, Girin N, et al. Overweight, obesity, physical activity and sugar-sweetened beverage consumption in adolescents of Pacific islands: results from the Global School-Based Student Health Survey and the Youth Risk Behavior Surveillance System. *BMC Obesity*. 2015;2:34. doi:10.1186/s40608-015-0062-4.
- Obesity in the Pacific Island Countries: a literature study on the main factors contributing to the extreme prevalence of obesity in Pacific Island Countries and the Nutrition Transition Model. WUR eDepot website. <https://Edepot.Wur.Nl/388368>. Accessed March 23, 2022.
- Thompson-McCormick JJ, Thomas JJ, Bainivualiku A, Khan AN, Becker AE. Breakfast skipping as a risk correlate of overweight and obesity in school-going ethnic Fijian adolescent girls. *Asia Pac J Clin Nutr*. 2010;19(3):372-382.
- Fox A, Feng W, Asal V. What is driving global obesity trends? Globalization or "modernization"? *Global Health*. 2019;15(1):1-16. doi:10.1186/s12992-019-0457-y.
- Ravuvu A, Waqa G. Childhood obesity in the Pacific: challenges and opportunities. *Curr Obes Rep*. 2020;9(4):462-469. doi:10.1007/s13679-020-00404-y.
- Tong TJ, Mohammadnezhad M, Alqahtani NS, Salusalu M. Perception of students on factors contributing to overweight and obesity among high school students in Kiribati: a qualitative study. *PLoS One*. 2022;17(1):e0260900. doi:10.1371/journal.pone.0260900.
- Haddad L, Cameron L, Barnett I. The double burden of malnutrition in SE Asia and the Pacific: priorities, policies and politics. *Health Policy Plan*. 2014;30(9):1193-1206. doi:10.1093/heapol/czu110.
- Wate JT, Snowdon W, Millar L, et al. Adolescent dietary patterns in Fiji and their relationships with standardized body mass index. *Int J Behav Nutr Phys Act*. 2013;10(1):45. doi:10.1186/1479-5868-10-45.
- Foster N, Thow AM, Unwin N, Alvarado M, Samuels TA. Regulatory measures to fight obesity in Small Island Developing States of the Caribbean and Pacific, 2015–2017. *Rev Panam Salud Publica*. 2018;42:1-7. doi:10.26633/rpsp.2018.191.
- Galy O, Yacef K, Caillaud C. Improving Pacific adolescents' physical activity toward international recommendations: exploratory study of a digital education APP coupled with activity trackers. *JMIR MHealth UHealth*. 2019;7(12):e14854. doi:10.2196/14854.
- Latu C, Moodie M, Coriakula J, Waqa G, Snowdon W, Bell C. Barriers and facilitators to food policy development in Fiji. *Food Nutr Bull*. 2018;39(4):621-631. doi:10.1177/0379572118797083.
- Cassels S. Overweight in the Pacific: links between foreign dependence, global food trade, and obesity in the Federated States of Micronesia. *Global Health*. 2006;2(1):10. doi:10.1186/1744-8603-2-10.
- Monteiro CA, Benicio MH, Iunes R, Gouveia Nda C, Taddei JA, Cardoso MA. ENDEF e PNSN: para onde caminha o crescimento físico da criança brasileira? *Cad Saude Publica*. 1993;9(Suppl 1):S85-S95. doi:10.1590/s0102-311x1993000500009.
- Tanjasiri SP, Wiersma LD, Moy KL, McEligot A. Physical activity, nutrition, and obesity among Pacific Islander youth and young adults in Southern California: an exploratory study. *Hawaii J Med Public Health*. 2018;77(10):251-258.
- Ayers BL, Shreve MD, Scott AL, et al. Social and economic influences on infant and child feeding practices in a Marshallese community. *Public Health Nutr*. 2019;22(08):1461-1470. doi:10.1017/s1368980018004007.
- Scrutinio D, Bellotto F, Lagioia R, Passantino A. Physical activity for coronary heart disease: cardioprotective mechanisms and effects on prognosis. *Monaldi Arch Chest Dis*. 2005;64(2):77-87. doi:10.4081/monaldi.2005.591.
- Gelaye B, Revilla L, Lopez T, Sanchez S, Williams MA. Prevalence of metabolic syndrome and its relationship with leisure time physical activity among Peruvian adults. *Eur J Clin Invest*. 2009;39(10):891-898. doi:10.1111/j.1365-2362.2009.02191.x.
- Phillips DR. Urbanization and human health. *Parasitology*. 1993;106(S1):S93-S107. doi:10.1017/s0031182000086145.
- Lenzi A. Why urbanisation and health? *Acta Biomed*. 2019;90(2):181-183. doi:10.23750/abm.v90i2.8354.
- Naja F, Hwalla N, Itani L, Karam S, Sibai AM, Nasreddine L. A Western dietary pattern is associated with overweight and obesity in a national sample of Lebanese ado-

- lescents (13–19 years): a cross-sectional study. *Br J Nutr.* 2015;114(11):1909-1919. doi:10.1017/S0007114515003657.
53. Kopp W. How western diet and lifestyle drive the pandemic of obesity and civilization diseases. *Diabetes Metab Syndr Obes.* 2019;12:2221-2236. doi:10.2147/DMSO.S216791.
54. Devaux M, Sassi F, Cecchini M, Borgonovi F, Church J. Exploring the relationship between education and obesity. *OECD J Econ Stud.* 2011;2011(1):1-40. doi:10.1787/eco_studies-2011-5kg5825v1k23.
55. Brown CL, Perrin EM. Obesity prevention and treatment in primary care. *AcadPediatr.* 2018;18(7):736-745. doi:10.1016/j.acap.2018.05.004.
56. Regional Office for the Eastern Mediterranean, World Health Organization. School policy on diet and physical activity: a practical guide to developing and implementing. <https://applications.emro.who.int/dsaf/dsa1038.pdf>. Accessed October 17, 2021.
57. Swinburn BA, Millar L, Utter J, et al. The Pacific Obesity Prevention in Communities project: project overview and methods. *Obes Rev.* 2011;12(Suppl 2):3-11. doi:10.1111/j.1467-789x.2011.00921.x.