



RESEARCH ARTICLE

# Frequency of watching television, owning a mobile phone and risk of being overweight/obese among reproductive-aged women in low- and lower-middle-income countries: A pooled analysis from Demographic and Health Survey data

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## Abstract

People who are overweight and obese suffer from significant health impacts that have increased globally. Concurrently, usage of information and communication devices such as television and mobile phones have also been growing, affecting people's weight. This study examined the association between watching television and owning a mobile phone with overweight and obesity among reproductive-aged women in low- and lower-middle-income countries (LLMICs). Data of 21 LLMICs reported between 2015 and 2020 were collected from the Demographic and Health Surveys. Multivariate logistic regression was performed to determine the association into three pooled segments: a group of 21 countries, the World Bank income classification and the regional categorisation of the countries. The all-inclusive prevalence of overweight or obesity was found at 27.1% among 175,370 reproductive-aged women, and this prevalence varied among countries. Overall, the odds of being overweight or obese were 1.20 (adjusted odds ratio [AOR]=1.20, 95% confidence interval [CI]: 1.15–1.24), 1.40 (AOR=1.40, 95% CI: 1.35–1.44) and 1.18 (AOR=1.18, 95% CI: 1.03–1.35) times higher among those who watched television less than once a week, at least once a week and almost every day, respectively, compared with those who did not watch television. Besides, women's mobile phone ownership is more likely to experience overweight or obesity (AOR=1.72, 95% CI: 1.67–1.77). Consistent results were found for the countries categorised according to the World Bank income and regional classification. Focus on sedentary behaviour, such as television watching and mobile phone use, of women and regional or country-specific innovative strategies and programs are of great immediate importance to decrease the prevalence of overweight and obesity.

**Keywords:** overweight; obesity; television; mobile; women

## Introduction

Globally, overweight and obesity are the major risk factors for growing incurable diseases, including hypertension, cancer, diabetes, and chronic respiratory diseases, which also contribute to deaths and disabilities (Fruh, 2017; Tianyi, Agbor, & Njamnshi, 2018). Globally, approximately 4 million deaths and 120 million disabilities occur because of overweight and obesity (Global

Burden of Disease [GBD] 2015, Obesity Collaborators, 2017). Worldwide the prevalence of overweight and obesity among women ranges between 29.8% and 38.0% (Ng *et al.*, 2014). However, the prevalence of overweight and obesity is also rising rapidly in low- and lower-middle-income (LLMICs) countries along with their economic growth. Overweight and obesity affect all ages of people in low- and middle-income countries (LMICs) as well as their social and economic status (Morgen & Sørensen, 2014). Overweight and obesity, in particular, are important risk factors for the development of various non-communicable diseases (NCDs) in women, and they also cause more difficulties during pregnancy than women of normal weight (Gupta *et al.*, 2019).

The burden of overweight and obesity is increasing in LMICs, and the global rise of overweight and obesity is initially influenced by socio-demographic, environmental, and genetic factors and sedentary lifestyles (Kassie *et al.*, 2020). Globally, billions of dollars per year are lost due to overweight and obesity, which weakens the opportunities for economic growth by reducing productivity and life expectancy and increasing disability and health care spending (Kassie *et al.*, 2020). The failure to invest in human wealth is connected with the rising prevalence of preventable morbidity and mortality for all ages (Bhurosy & Jeewon, 2014). This ultimately increases the economic burden to prevent the different overweight and obesity-related problems. However, energy expenditure is very low among women who often spend their leisure time watching television and using a mobile phone to play games and watch videos (Lepp *et al.*, 2013). This also increases their risk of accruing too much body weight. The invention of television and mobile phone, and subsequent commercialisation of the products globally, have changed the way we live and work.

Television and mobile phone use during bedtime reduces sleep duration (Dube *et al.*, 2017), impacting physical weight (Felson *et al.*, 2017). The good health condition of women, particularly in their reproductive age, is a prerequisite for the healthy delivery of offspring. Recent studies have found that, even in poor and less-educated communities, women of reproductive age have been experiencing more adverse pregnancy outcomes and neonatal death because of their overweight and obesity (Haque *et al.* 2021; Sutradhar *et al.*, 2021).

Access to television and mobile phone and the time spent watching television and using the mobile phone has attracted numerous researchers across the globe. A systematic review of the literature found that bedtime use of portable devices was related to less night-time sleep and more day-time sleep habits, which is not healthy (Carter *et al.*, 2016). Hale and Guan (2015) found that shortened duration of sleep time and delayed night-time sleep were associated with higher screen time among school-going children and adolescents. Li *et al.* (2017) also found that shorter sleeping time was associated with childhood obesity. Besides, a systematic review identified that physical activities decreased due to mobile phone use among college students (Lepp *et al.*, 2015). Watching television and access to a mobile phone during bedtime has decreased the sleep duration of Grade-V children in Alberta, Canada, by approximately 11 and 8 minutes, respectively, compared with those who do not have access to or use these technologies (Dube *et al.*, 2017). Mobile phone use was associated with obesity among adults in the USA (Chrisman *et al.*, 2016). In a study focusing on Bangladesh, obesity, particularly among women who are not engaged in any formal employment, was found to be positively associated with the time spent watching television (Chowdhury *et al.*, 2018). In India, television watching was also more associated with obesity among adult urban women than their rural counterparts (Gupta *et al.*, 2019). Women of reproductive age who watched television every day had a higher chance of becoming overweight and obese than those who never watched television (Gupta *et al.*, 2019; Das Gupta *et al.*, 2019).

Television and mobile phone are screen-based devices and are primarily practical technological development globally. A prior study found that screen-based media use affected sleep health, including time displacement, emotional stimulation and sleep physiology (LeBourgeois *et al.*, 2017). Screen time has a stronger correlation with the weight status of young Australians (Maher *et al.*, 2012). Higher Body Mass Index (BMI) among women was also influenced by access to television, as seen in Ghana (Tuoyire, 2018). In the Japanese context, mobile phone use and

screen time on a mobile phone was recognised as risk factors for overweight among children (Wada et al., 2019).

Women of their reproductive age often lead a sedentary lifestyle, increasing their risk of being overweight/obese. However, overweight and obesity in reproductive-aged women is a recognised and established cause of different health difficulties, including pre-eclampsia, eclampsia, hypertension and gestational diabetes mellitus (Kanguru et al., 2017; Kim et al., 2010). Overweight and obesity also increase the probability of infertility and miscarriage (Sharma et al., 2013). The sedentary behaviour of a reproductive-aged woman is also an independent risk factor for infertility (Gupta et al., 2019). Comparatively, nonworking women have more time watching television and using a mobile telephone. Evidence about adolescents' digital media uses between and among regions in low-middle-income countries (LMICs) exists (Banaji et al., 2018). Similarly, another study reported that low economic status groups of people spent more time watching television than people from higher economic status groups (Yang-Huang et al., 2017).

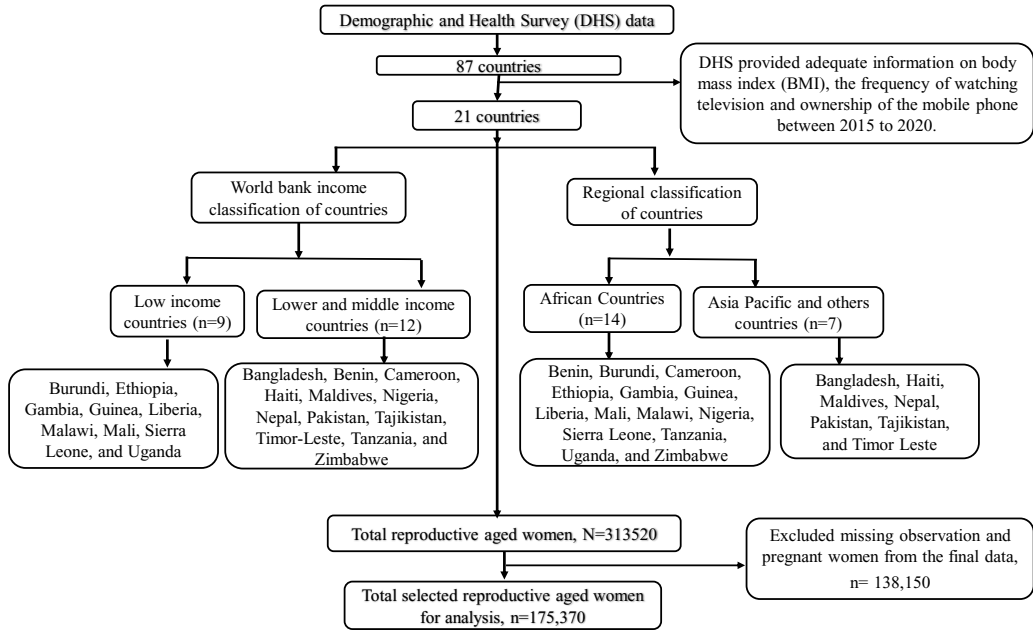
An intensive systematic review has revealed that individual and social activities influence obesity among women of reproductive age in LMICs (Trübswasser et al., 2021). Another study has found that internet use is becoming problematic among young people in selected LMICs (Fernandes et al., 2021). However, studies about internet use among women of reproductive age are hardly found. The context of LMIC concerning overweight and obesity in women of reproductive age has attracted many researchers (Trübswasser et al., 2021). The association among various factors, including mobile phone ownership and access to communication devices, are underexplored. Most of the studies examined the association between overweight and obesity with television watching (Gupta et al., 2019; Das Gupta et al., 2019). However, the mobile phone is also a screened-based device like television, and the research on the association between overweight and obesity with mobile phone use is not well established. Therefore, the present study aimed to identify the association between overweight and obesity with television watching and mobile phone use of reproductive age women in low-and lower-middle-income countries (LLMICs). Thus, this study can contribute to the regional or country-specific promotional health policy with innovative strategies and programs to decrease the prevalence of overweight and obesity of reproductive age women in LLMICs.

## Materials and methods

### *Data sources and procedures*

This study involved a cross-sectional analysis of data from the Demographic and Health Survey (DHS) of LLMICs. This study used pooled data of women from the individual recode files. Among 82 low ( $n=27$ ) and lower-middle ( $n=55$ ) income countries, 21 (low=9 and lower-middle=12) nationally representative cross-sectional datasets from the most recent DHS conducted after 2015 were used in this study. The selected 9 low-income countries are Burundi, Ethiopia, Gambia, Guinea, Liberia, Malawi, Mali, Sierra Leone and Uganda. The 12 lower-middle-income countries are Bangladesh, Benin, Cameroon, Haiti, Maldives, Nigeria, Nepal, Pakistan, Tajikistan, Timor-Leste, Tanzania and Zimbabwe. The following countries were also grouped by region: Africa region (Benin, Burundi, Cameroon, Ethiopia, Gambia, Guinea, Liberia, Mali, Malawi, Nigeria, Sierra Leone, Tanzania, Uganda and Zimbabwe) and the Asia Pacific and other regions (Bangladesh, Haiti, Maldives, Nepal, Pakistan, Tajikistan and Timor Leste). These countries were chosen because their DHS provided adequate information on body mass index (BMI), the frequency of watching television and ownership of the mobile phone. The detailed sample selection procedure is presented in Figure 1.

Although the DHS is a nationally representative household sample survey that collects data related to individuals' health and social aspects (Corsi et al., 2012), in this analysis, data for women of the reproductive age (i.e. 15–49 years) were only included. In all 21 countries, the DHS survey



**Figure 1.** Detail sample selection procedure for analysis.

followed the same standard procedures, and the survey data are available at <http://www.dhsprogram.com>. Detailed descriptions of DHS sampling procedures, questionnaire validation and data collection methods are published elsewhere (<http://www.dhsprogram.com>). A two-stage stratified sampling technique was used to select female respondents for the study. Enumeration areas (EAs) and households were randomly selected in the first and second stages, respectively. After adjustments for missing observations and pregnant women, 175,370 eligible women were selected for the final analysis.

### **Outcome variable**

The main outcome variable, overweight or obesity, was calculated from the female respondents (BMI). The participants were divided into categories: normal or underweight (BMI <25.0 kg/m<sup>2</sup>) and overweight (BMI between 25.0 kg/m<sup>2</sup> and <30.0 kg/m<sup>2</sup>) or obesity (BMI ≥30.0 kg/m<sup>2</sup>). The ranges were defined based on the World Health Organisation (WHO) and National Institutes of Health BMI cut-off values (National Heart, Lung, Blood Institute, National Institute of Diabetes, Digestive and Kidney Diseases, 1998). The study outcome was reported as a binary variable with “overweight or obesity” coded as ‘1’ and ‘not overweight or obesity’ coded as ‘0’.

### **Key explanatory variables**

The frequency of watching television and ownership of a mobile phone are major explanatory variables. The actual number of frequencies of viewing television was not available in DHS data. However, time spent viewing television was reported on a weekly measurement. The frequencies of viewing television were categorised by the DHS program as follows: (i) not at all, (ii) less than once a week, (iii) at least once a week and (iv) almost every day. However, ownership of a mobile phone was categorised as a binary response: (i) no and (ii) yes. All information was based on self-reported data from the survey participants.

### **Others explanatory variable**

Seven other explanatory variables were considered as covariates based on their availability in the DHS dataset and the extensive literature review (Ferdausi et al., 2022; Chowdhury et al., 2018; Chrisman et al., 2016; Dube et al., 2017; Gupta et al., 2019; Hale & Guan, 2015; Lajunen et al., 2007). These variables were age (15–24, 25–34 and 35–49 years), place of residence (urban and rural), women's education (no formal education, primary, secondary and higher), work status (no and yes), wealth index (poorest, poorer, middle, richer and richest), the number of household members ( $\leq 4$  and  $> 4$ ) and the number of children (0, 1–2, 3 and more).

### **Statistical analyses**

First, frequency and percentage were determined to show the weighted prevalence of overweight or obesity in the selected LLMICs. We cross-tabulated the distribution of overweight or obesity across the key explanatory variables and other covariates and the estimated Pearson's chi-square test of independence at a p-value of less than 0.05 to show significant factors. Furthermore, after adjusting the other covariates, a multivariate binary logistic regression analysis was conducted to examine the critical explanatory variables' association with overweight or obesity. The binary logistic regression model had all the key explanatory variables and other covariates. The results were presented using adjusted odds ratios (AOR) at a 95% Confidence Interval (CI). To improve our findings' generalisability, sample weight was used to correct for over and under-sampling, including the complex survey design. All the analyses were performed using R software.

## **Results**

### **Background characteristics**

The women's background characteristics and the prevalence of overweight or obesity were presented in Tables 1 and 2, respectively. Among the total women, the highest, 18,683 (10.7%), were from Bangladesh, and the lowest, 3,794 (2.2%), were from Liberia. A total of 109,482 (62.4%) lived in rural areas, and 92,417 (52.7%) were involved in work. A total of 64,923 (37.0%) women were from the 15–24 years age group, and 66,178 (37.7%) women had completed secondary education. However, 122,479 (69.8%) participants belonged to a family consisting of five or more members, and 76,450 (43.6%) had three or more children. Among the total women, 82,487 (47.0%) did not watch television, and 97,150 (55.4%) owned a mobile phone.

### **Prevalence of overweight or obesity**

The prevalence of overweight or obesity were varied among countries from 7.5% (95% CI: 7.4%–7.7%) in Ethiopia to 36.4% (95% CI: 36.2%–36.6%) in Liberia for low-income countries and 9.9% (95% CI: 9.7%–10.0%) in Timor-Leste to 51.7% (95% CI: 51.5%–51.9%) in Pakistan for lower-middle-income countries (Table 1). Overall, the prevalence of overweight or obesity was 27.1% (95% CI: 26.9–27.3%) among the LLMICs. The prevalence of overweight or obesity was higher among women in the 35–49 years age group (39.5%, 95% CI: 39.3–39.8%), in urban areas (37.4%, 95% CI: 37.2–37.6%), with higher education (40.5%, 95% CI: 40.2–40.7%) and within the richest household segment (41.3%, 95% CI: 41.1–41.5%). The prevalence of overweight or obesity among the women who watch television at least once a week and almost every day was 38.7% (95% CI: 38.5–38.9%) and 38.9% (95% CI: 38.7–39.2%), respectively. The prevalence of overweight or obesity was also higher among the women who owned a mobile phone (36.9%, 95% CI: 36.6–37.1%) (Table 2).

**Table 1.** Prevalence of overweight or obesity in the sample population across the 21 low- and lower-middle-income countries

Country	Frequency N (%)	BMI status, n (%)		Prevalence of overweight or obesity % (95% CI)
		BMI<25 (not overweight or obesity) n (%)	BMI≥25 (overweight or obesity) n (%)	
<b>Low-income countries</b>				
Burundi 2016–17	7909 (4.5)	7195 (91.0)	714 (9.0)	7.9 (7.8, 8.0)
Ethiopia 2016	13787 (7.9)	12202 (88.5)	1585 (11.5)	7.5 (7.4, 7.7)
Gambia, The 2019–20	5474 (3.1)	3643 (66.6)	1831 (33.5)	36.2 (36.0, 36.4)
Guinea 2018	4906 (2.8)	3610 (73.6)	1296 (26.4)	26.4 (26.2, 26.6)
Liberia 2019–20	3794 (2.2)	2564 (67.6)	1230 (32.4)	36.4 (36.2, 36.6)
Mali 2018	4576 (2.6)	3158 (69.0)	1418 (31.0)	27.5 (27.3, 27.7)
Malawi 2016–17	7418 (4.2)	5786 (78.0)	1632 (22.0)	20.9 (20.7, 21.1)
Sierra Leone 2019	7046 (4.0)	5167 (73.3)	1879 (26.7)	27.7 (27.5, 27.9)
Uganda 2016	5415 (3.1)	4228 (78.1)	1187 (21.9)	23.7 (23.5, 23.9)
<b>Lower middle-income countries</b>				
Bangladesh 2017–18	18683 (10.7)	12605 (67.5)	6078 (32.5)	32.1 (31.9, 32.4)
Benin 2017–18	7181 (4.1)	5321 (74.1)	1860 (25.9)	25.8 (25.5, 26.0)
Cameroon 2018	6255 (3.6)	3946 (63.1)	2309 (36.9)	37.0 (36.8, 37.3)
Haiti 2016–17	9050 (5.2)	6386 (70.6)	2664 (29.4)	31.8 (31.6, 32.0)
Maldives 2016–17	6842 (3.9)	3307 (48.3)	3535 (51.7)	49.5 (49.3, 49.7)
Nigeria 2018	13339 (7.6)	9711 (72.8)	3628 (27.2)	28.0 (27.8, 28.2)
Nepal 2016	6165 (3.5)	4950 (80.3)	1215 (19.7)	22.1 (21.9, 22.3)
Pakistan 2017–18	4682 (2.7)	2233 (47.7)	2449 (52.3)	51.7 (51.5, 51.9)
Tajikistan 2017	9922 (5.7)	6260 (63.1)	3662 (36.9)	37.1 (36.9, 37.4)
Timor-Leste 2016	11825 (6.7)	10711 (90.6)	1114 (9.4)	9.9 (9.7, 10.0)
Tanzania 2015–16	12035 (6.9)	8645 (71.8)	3390 (28.2)	28.4 (28.2, 28.6)
Zimbabwe 2015	9066 (5.2)	5751 (63.4)	3315 (36.6)	35.0 (34.7, 35.2)

**Association between the selected key variables**

To measure the association between key variables, the crude and adjusted odds of being overweight or obese were presented in Table 3. The results were shown in three segments.

**Overall pooled analyses**

The final model was adjusted for women's age, residence, education, working status, wealth index, number of household members and the number of children. This study found that the frequency of watching television and owning a mobile phone was significantly associated with overweight or obesity. Overall, women who watched television less than once a week, at least once a week and almost every day were 1.20 (AOR=1.20, 95% CI: 1.15-1.24;  $p<0.001$ ), 1.40 (AOR=1.40, 95% CI: 1.35-1.44;  $p<0.001$ ) and 1.18 (AOR=1.18, 95% CI: 1.03-1.35;  $p=0.015$ ) times, higher of being

**Table 2.** Prevalence of overweight or obesity in the sample population across the explanatory variables in 21 low- and lower-middle-income countries

Variable	Frequency N, (%)	BMI status, n (%)		Prevalence of over- weight or obesity % (95% CI)	p- value
		BMI < 25 (not over- weight or obesity) n, (%)	BMI ≥ 25 (overweight or obesity) n, (%)		
<b>Women's age (in years)</b>					<0.001
15–24	64923 (37.0)	56361 (86.8)	8562 (13.2)	13.1 (13.0, 13.3)	
25–34	54474 (31.1)	37303 (68.5)	17171 (31.5)	31.1 (30.9, 31.3)	
35–49	55973 (31.9)	33715 (60.2)	22258 (39.8)	39.5 (39.3, 39.8)	
<b>Place of residence</b>					<0.001
Urban	65888 (37.6)	41845 (63.5)	24043 (36.5)	37.4 (37.2, 37.6)	
Rural	109482 (62.4)	85534 (78.1)	23948 (21.9)	21.0 (20.8, 21.2)	
<b>Women's education</b>					<0.001
No education	46519 (26.5)	36457 (78.4)	10062 (21.6)	20.5 (20.3, 20.7)	
Primary	48395 (27.6)	36015 (74.4)	12380 (25.6)	25.2 (25.0, 25.4)	
Secondary	66178 (37.7)	46409 (70.1)	19769 (29.9)	30.2 (30.0, 30.4)	
Higher	14278 (8.1)	8498 (59.5)	5780 (40.5)	40.5 (40.2, 40.7)	
<b>Working status</b>					<0.001
No	82953 (47.3)	61832 (74.5)	21121 (25.5)	24.8 (24.6, 25.0)	
Yes	92417 (52.7)	65547 (70.9)	26870 (29.1)	29.1 (28.9, 29.3)	
<b>Wealth Index</b>					<0.001
Poorest	33276 (19.0)	27985 (84.1)	5291 (15.9)	15.1 (14.9, 15.2)	
Poorer	32123 (18.3)	25711 (80.0)	6412 (20.0)	18.8 (18.6, 19.0)	
Middle	33803 (19.3)	25315 (74.9)	8488 (25.1)	23.8 (23.6, 24.0)	
Richer	35354 (20.2)	24176 (68.4)	11178 (31.6)	31.2 (31.0, 31.4)	
Richest	40814 (23.3)	24192 (59.3)	16622 (40.7)	41.3 (41.1, 41.5)	
<b>Number of household members</b>					<0.001
1–4	52891 (30.2)	37442 (70.8)	15449 (29.2)	28.8 (28.6, 29.0)	
5 and more	122479 (69.8)	89937 (73.4)	32542 (26.6)	26.4 (26.2, 26.6)	
<b>Number of children</b>					<0.001
No children	47877 (27.3)	40885 (85.4)	6992 (14.6)	14.7 (14.6, 14.9)	
1–2	51043 (29.1)	35616 (69.8)	15427 (30.2)	30.0 (29.8, 30.2)	
3 and more	76450 (43.6)	50878 (66.6)	25572 (33.5)	32.9 (32.7, 33.1)	
<b>Frequency of watching television</b>					<0.001
Not at all	82487 (47.0)	67327 (81.6)	15160 (18.4)	17.6 (17.4, 17.8)	
Less than once a week	27899 (15.9)	20113 (72.1)	7786 (27.9)	27.7 (27.5, 27.9)	
At least once a week	63669 (36.3)	39125 (61.5)	24544 (38.6)	38.7 (38.5, 38.9)	

(Continued)

Table 2. (Continued)

Variable	Frequency N, (%)	BMI status, n (%)			p-value
		BMI <25 (not over- weight or obesity)	BMI ≥25 (overweight or obesity)	Prevalence of over- weight or obesity	
		n, (%)	n, (%)	% (95% CI)	
Almost every day	1315 (0.7)	814 (61.9)	501 (38.1)	38.9 (38.7, 39.2)	
<b>Owns a mobile telephone</b>					<0.001
No	78220 (44.6)	65861 (84.2)	12359 (15.8)	15.3 (15.1, 15.5)	
Yes	97150 (55.4)	61518 (63.3)	35632 (36.7)	36.9 (36.6, 37.1)	
Total	175370 (100)	127379 (72.6)	47991 (27.4)	27.1 (26.9, 27.3)	

overweight or obese, respectively, than their counterparts who did not watch television. Conditional on all other factors, women who owned a mobile phone had the strongest association with overweight or obesity, with an odds ratio of 1.72 (AOR=1.72, 95% CI: 1.67–1.77;  $p < 0.001$ ).

#### *Analyses according to the World Bank income classification of countries*

Upon stratification by low income and lower-middle-income countries, overweight or obesity displayed a significant association with the frequency of watching television and owning a mobile phone in categories of countries. In low-income countries, women who watch television less than once a week and at least once a week were 1.13 (AOR=1.13, 95% CI: 1.05–1.20;  $p = 0.024$ ) and 1.29 (AOR=1.29, 95% CI: 1.21–1.38;  $p = 0.024$ ) times more likely to be overweight or obese compared with the women who did not watch television any time. Similarly, a significant positive association was reported for women who owned a mobile phone (AOR=1.83, 95% CI: 1.73–1.93;  $p = 0.025$ ). In lower-middle-income countries, women watching television less than once a week, at least once a week, and almost every day had 20% (AOR=1.20, 95% CI: 1.15–1.25;  $p < 0.001$ ), 41% (AOR=1.41, 95% CI: 1.35–1.47;  $p < 0.001$ ) and 25% (AOR=1.25, 95% CI: 1.09–1.44;  $p = 0.001$ ) increased odds of being overweight or obese, respectively, compared with women not watching television at all. However, a significant direct relationship was found between the women who owned a mobile phone and overweight or obese (AOR=1.65, 95% CI: 1.59–1.71;  $p < 0.001$ ).

#### *Analyses according to the regional classification of countries*

Regionally, overweight or obesity showed significant association with the frequency of watching television and owning a mobile phone in Africa, the Asia Pacific and other regions. In African countries, women who watch television less than once a week (AOR=1.16, 95% CI: 1.11–1.21;  $p < 0.001$ ) and at least once a week (AOR=1.33, 95% CI: 1.27–1.39;  $p < 0.001$ ) were also found more likely to experience overweight and obesity than those not watching television at all. Women with mobile phone ownership had a higher risk of being overweight or obese than those with no mobile phone (AOR=1.82, 95% CI: 1.76–1.89;  $p < 0.001$ ) in African nations. In the Asia Pacific and other countries, the risk of being overweight or obese was increased with the increased frequency of watching television (AOR=1.17, 95% CI: 1.09–1.25,  $p < 0.001$  for women watching television less than once a week; AOR=1.37, 95% CI: 1.30–1.45,  $p < 0.001$  for at least once a week; and AOR=1.45, 95% CI: 1.19–1.77,  $p < 0.001$  for almost every day). In addition, women who owned mobile phones had 1.51 times (AOR=1.51; 95% CI: 1.44–1.59;  $p < 0.001$ ) higher risk of being overweight or obese than their counterparts without a mobile phone.



**Table 3.** Association of frequency of viewing television and owning mobile with overweight/obesity among reproductive age women in 21 low and lower middle-income countries

Variables	UOR (95% CI)	p-value	AOR (95% CI)	p-value
<b>Pooled data</b>				
<b>Frequency of watching television</b>				
Not at all	1.00	–	1.00	–
Less than once a week	1.72 (1.67, 1.77)	<0.001	1.20 (1.15, 1.24)	<0.001
At least once a week	2.79 (2.72, 2.85)	<0.001	1.40 (1.35, 1.44)	<0.001
Almost every day	2.73 (2.44, 3.06)	<0.001	1.18 (1.03, 1.35)	0.015
<b>Owns mobile telephone</b>				
No	1.00	–	1.00	–
Yes	3.09 (3.02, 3.16)	<0.001	1.72 (1.67, 1.77)	<0.001
<b>According to world bank income classification</b>				
<b>Low-income countries</b>				
<b>Frequency of watching television</b>				
Not at all	1.00	–	1.00	–
Less than once a week	2.02 (1.91, 2.13)	<0.001	1.13 (1.05, 1.20)	0.024
At least once a week	2.94 (2.81, 3.08)	<0.001	1.29 (1.21, 1.38)	0.024
Almost every day	–	–	–	–
<b>Owns mobile telephone</b>				
No	1.00	–	1.00	–
Yes	3.59 (3.44, 3.74)	<0.001	1.83 (1.73, 1.93)	0.025
<b>Lower and middle-income countries</b>				
<b>Frequency of watching television</b>				
Not at all	1.00	–	1.00	–
Less than once a week	1.49 (1.43, 1.54)	<0.001	1.20 (1.15, 1.25)	<0.001
At least once a week	2.45 (2.38, 2.52)	<0.001	1.41 (1.35, 1.47)	<0.001
Almost every day	2.30 (2.06, 2.58)	<0.001	1.25 (1.09, 1.44)	0.001
<b>Owns mobile telephone</b>				
No	1.00	–	1.00	–
Yes	2.68 (2.60, 2.75)	0.00	1.65 (1.59, 1.71)	<0.001
<b>According to regional classification</b>				
<b>Africa</b>				
<b>Frequency of watching television</b>				
Not at all	1.00	–	1.00	–
Less than once a week	1.92 (1.85, 2.00)	<0.001	1.16 (1.11, 1.21)	<0.001
At least once a week	3.01 (2.91, 3.10)	<0.001	1.33 (1.27, 1.39)	<0.001
Almost every day	–	–	–	–

(Continued)

Table 3. (Continued)

Variables	UOR (95% CI)	p-value	AOR (95% CI)	p-value
<b>Owens mobile telephone</b>				
No	1.00	–	1.00	–
Yes	3.86 (3.75, 3.98)	<0.001	1.82 (1.76, 1.89)	<0.001
<b>Asia Pacific and others</b>				
<b>Frequency of watching television</b>				
Not at all	1.00	–	1.00	–
Less than once a week	1.51 (1.42, 1.60)	<0.001	1.17 (1.09, 1.25)	<0.001
At least once a week	2.57 (2.46, 2.68)	<0.001	1.37 (1.30, 1.45)	<0.001
Almost every day	4.46 (3.74, 5.32)	<0.001	1.45 (1.19, 1.77)	<0.001
<b>Owens mobile telephone</b>				
No	1.00	–	1.00	–
Yes	2.02 (1.94, 2.10)	<0.001	1.51 (1.44, 1.59)	<0.001

## Discussion

This study investigated the association between watching television and owning a mobile phone and the prevalence of being overweight and obese among women of reproductive age using pooled data from the DHS. The study displayed that the prevalence of overweight or obesity had a rising trend among reproductive-aged women with a higher frequency of watching television in LLMICs. In addition, the prevalence of overweight or obesity was also higher among the women who owned a mobile telephone. It highlighted that women who regularly watch television are more likely to be overweight and obese. Furthermore, mobile phone owners reported greater odds of being obese and overweight than their counterparts who had no ownership of mobile phones.

The study demonstrated that the prevalence of overweight or obesity among reproductive-age women in LLMICs was 27.1% (95% CI: 26.9–27.3%). However, according to the World Health Organization, approximately half or more than half of the population are overweight/obese in the United States (61.1%), Europe (54.8%), and Eastern Mediterranean (46.0%), whereas a significantly lower prevalence is observed in Africa (26.9%), South-East Asia (13.7%), and the Western Pacific (25.4%) (Yatsuya *et al.*, 2014). In addition, the results of this study are much higher compared to the last three decades (Sutradhar *et al.*, 2021). The rising prevalence of overweight or obesity among reproductive-aged women might be characterised by shifting nutritional habits and a sedentary lifestyle (Subedi *et al.*, 2015). Over past the three decades, the consumption of meat, plant, oil and sugar increased significantly (Subedi *et al.*, 2015). Even people are also consuming fast food and processed food more than ever before, possibly due to their easy availability in markets (Subedi *et al.*, 2015). In addition, many people do not perform regular physical activity as per WHO recommendations (Ministry of Health and Population [MOHP] *et al.*, 2014). The possible reason behind the increased prevalence of overweight or obesity among reproductive-aged women is technological advancement and ease of access to devices such as television and cell phones. These devices are used to watch videos and play games. These activities mostly performed in a sitting, reclining, or lying posture with low energy expenditure are associated with overweight or obesity (Maher *et al.*, 2012).

The association of overweight or obesity with television viewing was coherent with different studies conducted in Myanmar (Das Gupta *et al.*, 2019), India (Gupta *et al.*, 2019), Ghana (Tuoyire, 2018) and Bangladesh (Chowdhury *et al.*, 2018). These studies reported that women

who own a television were more likely to be either overweight or obese compared with women who did not have a television. Given that television commercials influence human behaviour, women may gain weight from watching television, limited daily exercise, unhealthy diets and high caloric food consumption (Tuoyire, 2018; Maher et al., 2012).

Similarly, the respondents who own a mobile phone were reported to display a higher odds of being overweight or obese than women who do not own a mobile phone. A Finnish study investigating the prevalence of being overweight among twin adolescents with the association of mobile phone usage found a positive but weak correlation between the variables (Lajunen et al., 2007). The generalised study did not take a greater sample size of non-twin individuals and did not consider the mobile phone bills to monitor phone usage. However, a study conducted on a cohort of Japanese school attending children who use mobile phones had a higher risk of becoming overweight (Wada et al., 2019), concurring with the results found in the present study. Another study on the characteristics between mobile phone usage and the behaviour of the Mexican-Americans also correlated mobile phone use with overweight or obesity in adults (Chrisman et al., 2016). A probable explanation of such an alignment is that higher cell phone use frequency leads to more sedentary behaviour, reducing cardiovascular fitness among individuals. Such individuals impede their regularity of physical activity, causing obesity or being overweight (Lepp et al., 2015). Furthermore, several studies concentrating primarily on children and adolescents have found that the recurrence of using electronic devices interrupts sleep duration (Carter et al., 2016; Dube et al., 2017; LeBourgeois et al., 2017; Wada et al., 2019). Other studies have shown that sleep deprivation is positively associated with overweight and obesity (Felső et al., 2017; Li et al., 2017), inferring that excessive mobile phone use can affect adult sleep cycles and affect weight in females.

Given the current economic circumstances, sedentary lifestyles and obesogenic food practices are becoming more preferential among individuals (Das Gupta et al., 2019). Designing interventions that must lead to healthy nutritional practices contributing to individuals being overweight or obese. Women of their reproductive age may suffer from pregnancy complications due to being overweight and obese (Tennant et al., 2011). For a more accurate result, further research can account for the exact number of hours spent watching television and the hours of screen time for individuals owning a mobile phone.

### Policy and programme implications

Too much television watching and use of mobile telephone are significantly associated with being overweight or obese among reproductive-aged women. However, there is strong evidence that more television watching also raises the risk of weight-related chronic diseases such as diabetes, heart disease, and early death (Grøntved & Hu, 2011). There is convincing evidence that watching television and using the mobile telephone displace the physical activity time, reduce healthy diets, give more scopes for unhealthy snacking during television watching and interfere with sleep, which influences adults to be overweight or obese (Strasburger, 2011). Television watching and mobile phone usage are modifiable risk factors for overweight or obesity. Making television-free bedrooms and internet-free mobile can help to reduce the risk of being overweight or obese. Different educational programs about the destructive effect of more time watching television and using the mobile phone can play a vital role in controlling overweight or obesity problems (Gortmaker et al., 1999). In addition, change in social behaviour, the habit of regular physical activity and raising awareness among the population, especially among children and women, may help prevent overweight or obesity and weight-related diseases (Gupta et al., 2019).

## Strengths and limitations

The key strength of this study is the extensive pooled data from 21 LLMICs rather than focusing on one specific nation. Thus, the study can be more diverse, and the results to be more cohesive regarding different countries. Furthermore, this study has data from low and lower-middle-income countries to gauge the regional differences between the frequency of watching television and mobile phone ownership with women being overweight or obese. The large sample size, accountability for various regions and socioeconomic factors validate the positive association established with a low margin for error. To the best of our knowledge, this study is one of the first to establish a link between television viewing and mobile phone ownership and overweight or obesity in women of reproductive age.

These analyses are not without limitations. The cross-sectional aspect of the study can restrict the probability of drawing out a causal relationship between the association of watching television and mobile phone ownership with overweight or obesity of women of their reproductive age. The regularity of watching television was measured in weeks instead of hours or days, which may have generated less accurate information. In the multivariable analysis, diet plans, food habits, duration of or participation in any physical activity and hereditary factors were also not included (Das Gupta *et al.*, 2019). Additionally, this study aims to demonstrate a link between owning a mobile phone and being overweight or obese. The results do not provide further data on the frequency of screen time, which may have helped develop the time spent inactive while using mobile phones.

## Conclusion

In conclusion, mobile phone usage and watching television were positively associated with women of their reproductive age being overweight or obese in 21 LLMICs. The prevalence of overweight and obesity can have adverse effects on human health, including increasing non-communicable diseases and premature death. Reduced usage of electronic devices such as television and cell phones may effectively prevent weight gain and the associated health hazards.

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**Ethical approval.** This study used a secondary dataset taken from the Demographic and Health Surveys (DHS) Program website (<https://dhsprogram.com/data/>). The ICF Institutional Review Board (IRB) reviewed and approved the standard DHS surveys data. Additionally, country-specific DHS survey protocols are reviewed by an IRB in the host country. ICF IRB certifies that the survey complies with the US Department of Health and Human Services regulations for the safety of human subjects, whereas the corresponding host country IRB confirms that the survey complies with the rules and standards of the country. In addition, the written form is used to take consent from the reproductive-aged women. So, no ethics approval is required for this dataset.

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