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Frequency of Television viewing and prevalence of overweight and obesity among women of the reproductive age group in Myanmar: Results from a nationwide survey

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ABSTRACT

Objectives: This study aimed to find out the association between frequency of television viewing and overweight/obesity among reproductive age women of Myanmar.

Design: This was a cross-sectional study.

Setting: This study used Myanmar Demographic and Health Survey (2015-16) data.

Participants: Total 12,020 women aged 15-49 years and were not pregnant or didn't deliver a child within two months prior to the survey were included.

Primary and secondary outcome measures: The primary outcome was overweight (23.0 to <27.5 kg/m^2) and obesity (≥27.5 kg/m^2), which was measured by Asian BMI cut off.

Results: The prevalence of overweight was 26.5% and obesity was 12.2% among the study participants. The odds of being obese were 33% higher (adjusted relative risk ratio (ARRR): 1.334, 95% CI: 1.089- 1.635; *p*-value=0.006) among those who watched television at least once a week compared to those never watched television. Rural women who watched television at

least once a week were 1.4 times more likely to be obese (ARRR: 1.399, 95% CI: 1.113- 1.759; *p*-value=0.004) compared to those who did not watch television at all.

Conclusions: Frequent television watching was associated with obesity among rural women of reproductive age group in Myanmar.

Key words: Obesity, Overweight, Noncommunicable Disease, Myanmar

STRENGTHS AND LIMITATIONS OF THE STUDY

- This study utilized a nationally representative sample to investigate the relationship between the frequency of television viewing and prevalence of overweight/obesity among the women of the reproductive age group of Myanmar. So the findings of this study can be generalizable to the target population.
- The frequency of television viewing was measured in weeks, not in days/hours; the later could have given more precise information.
- In the multivariable analysis, food habit and duration of physical activity were not included because that information was not collected in MDHS.

INTRODUCTION

Both developed and developing countries are facing increasing burden of overweight and obesity, posing a major public health problem.[1-3] The prevalence of overweight and obesity increased by 27.5% among the global adult population and 47.1% among global children between 1980 and 2013.[4] During the same time period, globally, the prevalence of overweight and obesity rose from 29.8% to 38.0% among adult female.[4] Although this burden is lowest in South and South East Asia, countries of this region are experiencing a rising burden of overweight and obesity.[5] Historically, undernutrition was considered as the major nutritional problem in South and Southeast Asian countries like Bangladesh, India, Myanmar, and Nepal.[6] However, as a consequence of economic development and rapid urbanization, currently, these countries are going through a nutritional transition which brings forth nutritional excess (overweight and obesity) as an emerging public health problem.[7]

Myanmar is a low-middle income country (LMIC) situated in the Southeast Asia region. After 50 long years of military rule, the country has recently reformed into the democratic government system.[8 9] In 2015-16, first Myanmar Demographic and Health Survey (MDHS) was conducted using a nationally representative sample across the country.[10] The survey found a high prevalence of overweight (28.1%) and obesity (13.1%) among reproductive age group women.[11]

Overweight and obesity is an important risk factor for developing several noncommunicable diseases (NCDs) like type 2 diabetes mellitus (T2DM)[12], hypertension[13],

cardiovascular diseases (CVDs)[14], cancer[15] and chronic kidney diseases (CKD).[16] In addition, overweight and obese women experience complications during pregnancy (gestational diabetes mellitus (GDM), pre-eclampsia and eclampsia) more frequently than women having normal body weight.[17-20]

Physical inactivity along with consumption of high-calorie food is considered as the reason for increasing trend of overweight and obesity in many studies.[21-27] Physical inactivity was attributable to 13·4 million disability-adjusted life years (DALYs) lost worldwide in 2013.[28] It has been found that energy expenditure is very low among people who spend leisure time watching television rather than being involved in activities like playing games, gardening etc. which ultimately increase their risk of gaining excessive body weight.[29 30] People who watch television more frequently also intake more energy which sometimes is attributable to their frequent exposure to the advertisements of foods and beverages broadcast at television and subsequent consumption of the foods/beverages.[31-35]

Across the world, many studies have shown a positive association between the increased frequency of television viewing and overweight/obesity. In USA and Australia, it has been found that people who view television more frequently are at higher risk of being overweight/obese.[34 36-38] This association has not been explored widely in South and South Asian countries. Therefore, we conducted this study to determine the association between television

viewing and prevalence of overweight and obesity among reproductive age group women in the context of Myanmar using the MDHS 2015-16 data.

METHODS

study settings

According to the 2014 census, the total population of Myanmar was 51.5 million with population density of 76 persons per square kilometer (km^2).[39] The country is the home to 135 ethnic groups.[39 40] The *Gross Domestic Product* (*GDP*) of Myanmar was 6.4% and per capita, Gross National Income (GNI) was 1,455 USD in 2016-17. More than quarter (26.1%) of the population was living under the poverty line in 2014. Myanmar has the lowest life expectancy at birth (66.6 years) among the Association of Southeast Asian Nations (ASEAN) countries. High Under-five mortality rate is also high in Myanmar.[39 41]

study design

This study analyzed the data of MDHS 2015-16, first Demographic and Health Survey of Myanmar.[10] MDHS 2015-16 was a cross-sectional survey which used a nationally representative sample and was conducted by a joint collaboration between the Ministry of Health and Sports of Myanmar and ICF International. United States Agency for International Development (USAID) and 3MDG provided financial support to the survey. Two-stage cluster sampling technique was used for sample selection. The sample was stratified for each of the seven states and eight regions of Myanmar. The detailed method has been published previously.[10] In MDHS, 13,260 households were selected for the final sample. The target group

of this study was women of reproductive age group (15-49 years). The permanent residents and the visitors who stayed in the selected households the night before the day of data collection were included in the questionnaire survey. Around 96% eligible women agreed to participate in the survey. Among them, 98% agreed for anthropometric measurement. However, pregnant women and women who gave birth within preceding two months of the survey were excluded. The final sample size of this study was 12,020 (Figure 1**).**

survey tools and data collection

A standard set of woman's questionnaire used by the DHS program was adopted according to the local context and pre-tested to collect the socio-demographic information (e.g., age, sex, household wealth index, place of residence) through face-to-face interview. A workshop was conducted involving stakeholders from the government, nongovernment organizations (NGOs) and development partners to design the questionnaire. The MDHS Technical Committee approved the final questionnaire. It was then translated into local language and back-translated into English to maintain the quality. Trained field staffs carried out the interviews and anthropometric measurements. Measuring boards specially made by Shorr Productions was used for height measurement and lightweight SECA scales with digital screens were used for measuring the weight of the respondents.

After training of the data collectors and pre-testing of the questionnaires, data were collected with tablet computers using computer-assisted field editing (CAFE) procedures. The

MDHS core team provided the technical support. Data quality was monitored by weekly field check tables and a mechanism was developed to provide immediate feedback to the data collectors.[10]

outcome and independent variables

The main outcome variables of this study were overweight and obesity. To define these variables, Asia specific body mass index (BMI) cut-off value was used,[42] that means we considered women having BMI <23.0 kg/m^2 as normal weight and underweight, women having BMI between 23.0 kg/m^2 and <27.5 kg/m^2 as overweight and women having BMI ≥27.5 kg/m^2 as obese.

The main independent variable of interest for this study was the frequency of viewing television. Data were collected as the following categories: (1) not viewing television at all, (2) viewing television less than once a week, and (3) viewing television at least once a week.[10] The other explanatory variables had been considered based on the literature review were age group, place of residence , region of residence, education, wealth quintile, , current working status and parity. The categories of the variables are mentioned in Table 1.

Table 1: List of variables considered for the study

Name of the Variables	**Categories**
Outcome Variables:	
Body Mass Index (BMI)	a) Normal weight and underweight (BMI < 23 kg/m^2)

	b) Overweight (BMI 23.0 kg/m^2 - <27.5 kg/m^2) c) Obesity (BMI ≥27.5 kg/m^2)
Dependent Variables:	
1. Age Groups	a) 15-24 years b) 25-34 years c) 35-49 years
2. Place of residence	a) Urban b) Rural
3. Region of residence	a) Kachin b) Kayah c) Kayin d) Chin e) Sagaing f) Taninthayi g) Bago h) Magway i) Mandalay j) Mon k) Rakhine l) Yangon m) Shan n) Ayeyarwaddy o) Naypyitaw

4. Education	a) No education b) Primary education c) Secondary education d) Higher education
5. Wealth quintile	a) Poorest b) Poorer c) Middle d) Richer e) Richest
6. Current working status	a) Yes b) No
7. Parity	a) 0 b) 1 c) 2 d) 3 e) 3+

data analysis

Weighted descriptive statistics (frequency and percentage) were used to present the socio-demographic characteristics of the respondents. Chi-square (χ^2) test was performed to see whether the groups according to the BMI status differ for the explanatory variables. To find the association between the explanatory and outcome variables multinomial logistic regression analysis was conducted. The variables showed *p*-value <0.05 in multivariable analysis were

considered as statistically significant. Both unadjusted and adjusted Relative Risk Ratio (RRR) were reported. All the analysis was done using Stata 13.0.

ethical consideration

MDHS received ethical approval from Ethics Review Committee on Medical Research including Human Subjects in the Department of Medical Research, Ministry of Health and Sports as well as from the ICF Institutional Review Board. Written informed consent was taken from the participants. In case of minor participants, assent form was signed by the respondents and written informed consent was given by the adult guardian.

patient involvement

Patients were not involved in the study.

FINDINGS

socio-demographic characteristics of the respondents

The socio-demographic characteristics of the respondents are presented in Table 2. Majority of the study participants were aged between 35 years and 49 years (42.3%) and were resident of the rural area (70.8%). The highest proportion of participants was from the Yangon region (15.1%), followed by Ayeyarwaddy (12.5%) and Mandalay region (12.2%) whereas lowest participation was from Kayah region (0.5%). Around half of the respondents (41.3%) were educated up to the primary level and about one-third (36.1%) received secondary level education, however, 10.2% received higher education and 12.4% received no education. More than two-third (68.1%) of the women were employed at the time of interview. Nearly two-fifths of the women (41.7%) were nulliparous, while cumulatively similar proportion of respondents (46.6%) had experience of being pregnant- for one time (15.3%), two times (15.8%) and more than three times (15.5%). Regarding household wealth index highest proportion of the respondents belonged to richest wealth quintile (22.2%) followed by richer (21.1%) and middle (20.9%) quintile. Among our study participants, the majority (60.1%) reported that they watched television at least once a week; however, 23.1% did not watch television at all and 16.8% watched television less than once a week. Noticeably, more than quarter (26.5%) of our study participants were overweight, and 12.2% of them were obese.

Table 2: Socio Demographic Characteristics of the Study Participants, MDHS 2015-16 (N= 12,020)

Variable	Frequency (Percentage)
Age Group (years)	
15-24	3433 (28.6)
25-34	3503 (29.1)
35-49	5084 (42.3)
Place of Residence	
Urban	3505 (29.2)
Rural	8515 (70.8)
Region of Residence	
Kachin	333 (2.8)
Kayah	60 (0.5)
Kayin	274 (2.3)
Chin	90 (0.8)
Sagaing	1351 (11.3)
Taninthayi	265 (2.2)
Bago	1197 (9.9)
Magway	1030 (8.6)
Mandalay	1462 (12.2)
Mon	432 (3.6)
Rakhine	695 (5.8)
Yangon	1822 (15.1)
Shan	1216 (10.1)
Ayeyarwaddy	1508 (12.5)
Naypyitaw	285 (2.3)
Highest Educational Status	
No Formal Education	1484 (12.4)
Primary	4966 (41.3)
Secondary	4345 (36.1)
Higher	1255 (10.2)
Currently Employed	
Yes	8183 (68.1)
No	3837 (32.9)
Wealth index	
Poorest	2052 (17.1)
Poorer	2251 (18.7)
Middle	2509 (20.9)
Richer	2533 (21.1)
Richest	2675 (22.2)
Parity	
0	5009 (41.7)
1	1844 (15.3)

2	1903 (15.8)
3	1405 (11.7)
3+	1859 (15.5)
Frequency of Viewing Television	
Not at all	2777 (23.1)
Less than once a week	2015 (16.8)
At least once a week	7227 (60.1)
Body Mass Index **(BMI)**	
BMI <23 (normal weight and underweight)	7373 (61.3)
23≥ BMI <27.5 (overweight)	3186 (26.)
BMI ≥27.5 (obese)	1460 (12.2%)

MDHS, Myanmar Demographic and Health Survey

The frequency of watching television at least once a week was higher among the urban women (80.8% versus 51.7%) than the rural women. Around 30% of the rural women didn't view television at all, where the proportion was less for the urban women (7.2%) (Figure 2).

prevalence of overweight and obesity across the explanatory variables

Table 3 shows the prevalence of three categories of BMI across the explanatory variables with the chi-square ($\chi 2$) value. Except for current employment status, significant differences were found among the BMI of women across the explanatory variables. The prevalence of overweight and obesity increased with age (p-value<0.0001) and was the most common in Yangon and Kachin region (p-value<0.0001). This prevalence was also higher in the urban areas compared to the rural areas (overweight: 31.1% versus 24.6%; obesity: 17.9% versus 9.8%; p-value<0.0001). Plausibly, Women with higher educational status, having two children, belonging to the richest wealth group had a higher prevalence of overweight and obesity (p-value<0.0001). The prevalence of overweight and obesity was also higher among the individuals who used to watch television at least once a week (p-value<0.0001).

214 **Table 3: Prevalence of overweight and obesity across the explanatory variables, MDHS 2015-16**

Variable	BMI Status (%)			$\chi 2$	*p*-value
	BMI <23	23≥ BMI <27.5	BMI ≥27.5		
Age Group (years)					
15-24	82.4	14.3	3.3	173.8569	**<0.0001**
25-34	60.4	27.6	12.0		
35-49	47.7	34.0	18.3		
Place of Residence					
Urban	51.0	31.1	17.9	258.4282	**<0.0001**
Rural	65.6	24.6	9.8		
Region of Residence					
Kachin	54.6	30.0	15.4	240.1499	**<0.0001**
Kayah	63.3	27.1	9.6		
Kayin	59.1	27.1	13.8		
Chin	71.7	23.9	4.4		
Sagaing	58.7	27.7	13.6		
Taninthayi	57.0	28.6	14.4		
Bago	64.5	25.9	9.6		
Magway	67.7	24.0	8.3		
Mandalay	64.2	25.4	10.5		
Mon	59.7	25.0	15.3		
Rakhine	75.3	19.2	5.5		
Yangon	49.7	33.8	16.5		
Shan	60.2	25.7	14.1		
Ayeyarwaddy	64.8	23.3	11.8		
Naypyitaw	63.3	26.0	10.7		
Highest Educational Status					
No formal education	65.4	25.3	9.3	40.4818	**0.0003**
Primary	59.8	27.6	12.6		
Secondary	63.1	25.3	11.6		
Higher	56.6	28.1	15.3		

Current Employment Status					
Yes	61.2	26.6	12.2	0.2181	0.9348
No	61.6	26.4	12.0		
Wealth Index					
Poorest	75.2	18.6	6.2	427.7143	**<0.0001**
Poorer	66.8	25.0	8.2		
Middle	61.5	28.0	10.5		
Richer	57.2	28.2	14.6		
Richest	49.9	30.9	19.2		
Parity					
0	75.2	18.4	6.4	759.5925	**<0.0001**
1	55.5	30.8	13.7		
2	49.4	32.7	17.9		
3	45.6	36.1	18.3		
3+	54.0	30.4	15.6		
Frequency of viewing Television					
Not at all	67.2	24.5	8.3	89.6916	**<0.001**
Less than once a week	63.3	25.9	10.8		
At least once a week	58.5	27.5	14.0		

BMI, body mass index; MDHS, Myanmar Demographic and Health Survey.

association between the frequency of viewing television and overweight and obesity

Multinomial logistic regression was fitted to find out the association between frequency of viewing television and overweight and obesity. The results are presented in Table 4. In the final model after adjusting for age, place and region of residence, wealth index, highest educational status, current employment status and parity, it was found that, women who watched television at least once a week were 1.3 times higher odds of being obese than the women who never watched television (ARRR: 1.334, 95% CI: 1.089- 1.635; *p*-value=0.006). However, the frequency of watching television and overweight revealed no statistically significant association.

When stratified by urban and rural residence, neither overweight nor obesity showed any significant association with frequency of viewing television in the urban areas. However, in the rural areas, women who viewed television least once a week had 1.4 times likely to be obese than those who didn't watch television at all (ARRR: 1.399, 95% CI: 1.113- 1.759; *p*-value=0.004).

Table 4: Association between the frequency of viewing Television and overweight and obesity among reproductive age women of Myanmar, MDHS 2015-16

Frequency of viewing Television	Overweight (23≥ BMI <27.5)				Obesity (BMI ≥27.5)			
	CRRR	*p*-value	ARRR	*p*-value	CRRR	*p*-value	ARRR	*p*-value
Total:								
Not at all	Ref		Ref		Ref		Ref	
Less than once a week	1.122 (0.940 - 1.340)	0.201	0.990 (0.822-1.193)	0.919	1.371 (1.075-1.748)	**0.011**	1.063 (0.831-1.358)	0.627
At least once a week	1.287 (1.127-1.469)	**<0.0001**	1.076 (0.928-1.248)	0.331	1.931 (1.595-2.337)	**<0.0001**	1.334 (1.089-1.635)	**0.006**
In Urban Area:								
Not at all	Ref		Ref		Ref		Ref	
Less than once a week	1.285 (0.830-1.990)	0.258	0.948 (0.562-1.600)	0.841	1.081 (0.635-1.840)	0.773	0.948 (0.562-1.600)	0.841
At least once a week	1.316 (0.886-1.954)	0.171	1.117 (0.738-1.691)	0.597	1.242 (0.839-1.841)	0.276	1.117 (0.738-1.691)	0.597
In Rural Area:								
Not at all	Ref		Ref		Ref		Ref	
Less than once a week	1.036(0.850-1.262)	0.727	0.947(0.771-1.161)	0.598	1.273 (0.966-1.678)	0.086	1.055 (0.801-1.380)	0.702
At least once a week	1.101(0.955-1.268)	0.184	1.040 (0.891-1.215)	0.616	1.607 (1.289- 2.004)	**<0.0001**	1.399 (1.113-1.759)	**0.004**

MDHS, Myanmar Demographic and Health Survey; CRRR, Crude Relative Risk Ratio; ARRR, Adjusted Relative Risk Ratio.

Adjusted for age, place of residence, region of residence, highest educational status, current employment status, wealth index, and parity.

Model goodness-of-fit: To assess the internal validity of the regression model, the F-adjusted mean residual goodness-of-fit test was used. The *p*-value of the F statistics of the adjusted model was <0.001, indicating an acceptable model fitness

DISCUSSION

To the best of our knowledge, this is the first study to utilize a nationally representative sample to examine the association between frequency of television viewing with the prevalence of overweight and obesity among women of reproductive age group in Myanmar. The prevalence of overweight and obesity was higher among the women living in the urban areas than the in rural areas. This finding is consistent with the study done in other South and South East Asian countries as well as in the other continents.[3 21 43-48] Urban women had a higher frequency of television watching.. Similar findings were reported in studies conducted in Bangladesh.[21] This may be due to higher coverage of electricity and a availability of many satellite channels in the urban area in comparison to the rural areas.[21]

It was found in our study that among rural women, the prevalence of obesity was significantly associated with watching television for at least once a week. This finding is also consistent with the finding from Bangladesh.[21]

Despite the frequency of watching television had no association with overweight and obesity among the urban women, they were more likely to be overweight/obese than the rural

women. This may be explained by the sedentary lifestyle and intake of high-calorie food by the urban residents, those determinants had overridden the effect of increased frequency of watching television. On the other hand, due to the presence of less developed transportation facilities, involvement in more laborious work and less consumption of obesogenic diets in the rural area, the prevalence of overweight/obesity is less there.[21] Those who view television more frequently in the rural area; they are more prone to lead sedentary lifestyle and are at risk of developing obesity.[21 49 50]

comparison with previous studies

The finding of our study is coherent with a recent study in Bangladesh which showed a positive association between frequency of television viewing and overweight/obesity in women of reproductive age group.[21] In the context of developed countries (for example, USA and Australia) a positive association between the increased frequency of television viewing and overweight/obesity has been found.[34 36-38] In a recently published multi-country study, this association has also been observed in case of children and adolescents.[51]

policy and program implications

High prevalence of overweight/obesity is associated with increased NCD burden in Myanmar, as shown in the recent evidence.[11 52] With the economic development of the country, people of Myanmar are getting more used to with sedentary lifestyle and obesogenic food, which, in turn, is raising the burden of overweight/obesity. Considering the epidemiologic,

demographic, and nutritional transition, the policy makers of Myanmar should focus on the prevention and control of both overweight/obesity and NCDs. Newly released 'Myanmar National Health Plan 2017-2021' incorporates the prevention and control programs of NCDs.[53] Along with this, Social Behavioral Change Communication (SBCC) campaign should be developed in order to promote physical activity and create awareness among the population, specially among the children and the adolescents in order to prevent overweight/obesity at the beginning of the life. Further research should be performed among men and adolescents to determine whether this positive association exists among those target population or not.

STRENGTHS AND LIMITATIONS

This is the first study which utilized a nationally representative sample to examine the association between frequency of watching television with overweight/obesity among the reproductive age group women in Myanmar. However, the survey could not establish the temporal relationship between the exposure and outcome variables because of its cross-sectional design. The frequency of television viewing was measured in weeks, not in days/hours; the latter could have given more precise information. In the multivariable analysis, food habit and duration of physical activity were not included because this information was not collected in MDHS. Finally, there may be the presence of reporting bias while measuring the frequency of television watching.

CONCLUSIONS

The rising burden of obesity and overweight is now a global concern., Obesity ultimately leads an individual to develop NCDs and premature death. Our study results demonstrate that watching television is associated with obesity among women in Myanmar. Therefore, necessary steps should be taken to make people aware of harmful consequences of physical inactivity as well as to encourage them to in physical activity. Additional research is also warranted to explore the situation in the general population of Myanmar.

LIST OF ABBREVIATION

ASEAN- Association of Southeast Asian Nations

BMI- Body Mass Index

GDP- *Gross Domestic Product*

GNI- Gross National Income

NCDs- Non-Communicable Diseases

MDHS- Myanmar Demographic and Health Survey

SBCC- Social Behavioral Change Communication

SEARO- South-East Asia Regional Office

USAID- United States Agency for International Development

USD- United States Dollar

WHO- World Health Organization

3MDG- Three Millennium Development Goal Fund

Contributors

RDG, IHS, MH, IS and MS conceptualized the study. RDG, IHS, MH, IS, MRH and MS designed the study and acquired the data. RDG, IHS, MH and IS conducted the data analysis. RDG, IHS, MH, IS, MRH and MS interpreted the data. RDG, IHS, MH, IS and MRH prepared the first draft. RDG, IHS, MH, IS, MRH and MS participated in critical revision of the manuscript and contributed to its intellectual improvement. All authors went through the final draft and approved it for submission. RDG, IHS, MH and IS equally contributed in this work as first author.

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Competing Interests

None declared.

Patient consent

None Declared

Disclaimer

The authors are alone responsible for the integrity and accuracy of data analysis and the writing the manuscript.

Ethics approval

The datasets were obtained from DHS Programme with proper procedure. The study exempt from collecting ethical approval because the survey protocols were reviewed and approved by Ethics Review Committee on Medical Research including Human Subjects in the Department of Medical Research, Ministry of Health and Sports as well as from the ICF Institutional Review Board.

Data sharing statement

The dataset of MDHS 2015-16 is available at the Demographic and Health Surveys Program. Extra data is available which is available on request at http://dhsprogram-com/what-we-do/survey/survey-display-349.cfm.

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Figures:

Figure 1: Flowchart showing the process of selecting the participants in the survey

Figure 2: Distribution of the respondents by place of residence with frequency of watching television

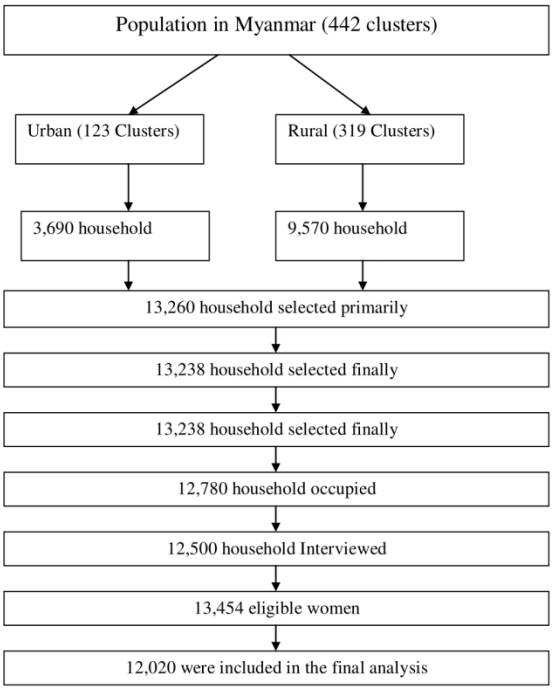
Supplementary Materials:

Supplementary File 1: STROBE Checklist

Supplementary File 2: Supplementary Table 1: Adjusted odds ratios for factors associated with overweight and obesity compared to normal weight among women of Myanmar, MDHS 2015-16.

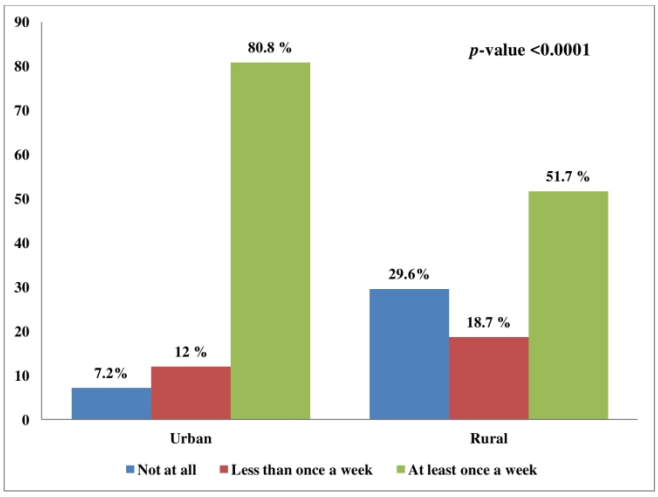
Supplementary File 3: Supplementary Table 2: Adjusted odds ratios for factors associated with overweight and obesity compared to normal weight for urban area among women of Myanmar, MDHS 2015-16.

Supplementary File 4: Supplementary Table 3: Adjusted odds ratios for factors associated with overweight and obesity compared to normal weight for rural area among women of Myanmar, MDHS 2015-16.



Flowchart showing the process of selecting the participants in the survey

143x186mm (300 x 300 DPI)



Distribution of the respondents by place of residence with frequency of watching television

143x186mm (300 x 300 DPI)

Supplementary Table 1: Adjusted odds ratios for factors associated with overweight and obesity compared to normal weight among women of Myanmar, MDHS 2015-16.

Variable	Overweight (23≥ BMI <27.5)				Obesity (BMI ≥27.5)			
Age Group (years)	Adjusted RRR	95% CI		*p*-value	Adjusted RRR	95% CI		*p*-value
		Lower Limit	Upper Limit			Lower Limit	Upper Limit	
15-24	Ref				Ref			
25-34	2.014178	1.716823	2.363035	**<0.0001**	3.453528	2.530329	4.713558	**<0.0001**
35-49	3.047071	2.576591	3.60346	**<0.0001**	6.250267	4.556371	8.573892	**<0.0001**
Place of Residence								
Urban	Ref				Ref			
Rural	0. 7866087	0.662566	0.9338741	0.006	0.6516484	0.5244415	0.8097104	**<0.0001**
Region of Residence								
Kachin	Ref				Ref			
Kayah	0.7747752	0.5352607	1.121466	0.176	0.5308337	0.3379477	0.8338106	**0.006**
Kayin	0.865386	0.6301812	1.188377	0.371	0.8680791	0.6063682	1.242745	0.439
Chin	0.6542445	0.4568423	0.9369444	**0.021**	0.2413828	0.1530058	0.3808067	**<0.0001**
Sagaing	0.871381	0.6190346	1.226595	0.429	0.8686633	0.6093857	1.238257	0.435
Taninthayi	1.024705	0.7408348	1.417348	0.882	1.030117	0.6931852	1.530819	0.883
Bago	0.7593014	0.5547193	1.039334	0.085	0.5695773	0.3946052	0.8221339	**0.003**
Magway	0.6498518	0.4593069	0.919445	**0.015**	0.4745499	0.3306871	0.6809992	**<0.0001**
Mandalay	0.6863519	0.495081	0.951517	**0.024**	0.5367759	0.3719	0.7747	**0.001**

		7	6			034	399	
Mon	0.7907257	0.5428866	1.151709	0.220	0.9121818	0.5952813	1.397786	0.672
Rakhine	0.6639056	0.4607493	0.9566386	**0.028**	0.4831741	0.3258298	0.7165004	**<0.0001**
Yangon	1.122907	0.796641	1.582797	0.507	0.8897992	0.6200706	1.276859	0.525
Shan	0.84052	0.5897948	1.19783	0.336	0.9392429	0.6368666	1.385184	0.751
Ayeyarwaddy	0.7594529	0.5454867	1.057347	0.103	0.8496266	0.5608967	1.286985	0.441
Naypyitaw	0.744938	0.5292849	1.048457	0.091	0.5791332	0.3768765	0.8899341	**0.013**
Highest Educational Status								
No Formal Education	Ref				Ref			
Primary	1.153131	0.956893	1.389614	0.134	1.465104	1.137168	1.887611	**0.003**
Secondary	1.193937	0.9457846	1.507198	0.136	1.466041	1.075991	1.997485	**0.015**
Higher	1.038379	0.7783529	1.385272	0.797	1.211783	0.8417414	1.7445	0.301
Marital Status								
Single	Ref				Ref			
Married	1.574419	1.251288	1.980995	**<0.0001**	1.878905	1.290944	2.734655	**0.001**
Separated/ Divorced/ Widowed	1.052985	0.7977657	1.389854	0.715	0.9991828	0.641503	1.556292	0.997
Currently employment								
No	Ref				Ref			
Yes	1.046469	0.9228303	1.186673	0.478	1.113853	0.9502117	1.305676	0.183
Wealth index								

Poorest	Ref				Ref			
Poorer	1.463942	1.227376	1.746103	**<0.0001**	1.446222	1.073628	1.948121	**0.015**
Middle	1.859199	1.530768	2.258096	**<0.0001**	2.117198	1.561836	2.870035	**<0.0001**
Richer	1.947941	1.576063	2.407564	**<0.0001**	2.913029	2.133331	3.977693	**<0.0001**
Rich	2.276987	1.771738	2.926319	**<0.0001**	4.003093	2.819404	5.683736	**<0.0001**
Parity								
0	Ref				Ref			
1	1.448628	1.135308	1.848419	**0.003**	1.529933	1.030449	2.271529	**0.035**
2	1.414514	1.100211	1.818606	**0.007**	1.677003	1.135706	2.476289	**0.009**
3	1.601212	1.231188	2.082445	**<0.0001**	1.808826	1.226071	2.668567	**0.003**
3+	1.243818	.9581223	1.614704	0.101	1.601881	1.07398	2.389266	**0.021**
Frequency of watching TV								
Not at all	Ref				Ref			
Less than once a week	0.9904753	0.8225536	1.192678	0.919	1.062536	0.831349	1.358014	0.627
At least once a week	1.076105	0.9278184	1.248092	0.331	1.333905	1.088042	1.635326	**0.006**

Supplementary Table 2: Adjusted odds ratios for factors associated with overweight and obesity compared to normal weight for urban area among women of Myanmar, MDHS 2015-16.

Variable	Overweight (23≥ BMI <27.5)				Obesity (BMI ≥27.5)			
Age Group (years)	Adjusted RRR	95% CI		*p*-value	Adjusted RRR	95% CI		*p*-value
		Lower Limit	Upper Limit			Lower Limit	Upper Limit	
15-24	Ref				Ref			
25-34	1.99629	1.511645	2.636315	**<0.0001**	4.662324	2.941363	7.390199	**<0.0001**
35-49	3.631152	2.661972	4.953195	**<0.0001**	11.90942	7.439211	19.06577	**<0.0001**
Region of Residence								
Kachin	Ref				Ref			
Kayah	0.6197694	0.3415865	1.1245	0.114	0.535549	0.2663595	1.076788	0.079
Kayin	0.9026549	0.6332612	1.286651	0.568	0.9352865	0.5386067	1.624118	0.811
Chin	1.010079	0.6093459	1.674352	0.969	0.4215907	0.2488876	.7141325	**0.002**
Sagaing	0.8465951	0.5540117	1.293697	0.438	1.131411	0.6621374	1.933271	0.649
Taninthayi	0.6013035	0.3472516	1.041222	0.069	0.5079112	0.2597578	0.9931321	**0.048**
Bago	0.7487075	0.457641	1.224897	0.246	0.4372885	0.2406765	0.7945156	**0.007**
Magway	0.3872192	0.1664396	.9008591	**0.028**	0.5108682	0.2888877	0.903418	**0.021**
Mandalay	0.8098875	0.5581317	1.175202	0.264	0.8457557	0.4863151	1.470863	0.550
Mon	0.5160773	0.2762577	.9640843	**0.038**	0.6199155	0.2671926	1.43827	0.263
Rakhine	0.5414014	0.377641	.7761741	**0.001**	0.6079698	0.3650	1.01241	0.056

		3				95	4	
Yangon	0.9914488	0.6512526	1.509354	0.968	1.015649	0.5795707	1.779841	0.956
Shan	0.8882496	0.5572852	1.415769	0.615	1.158867	0.552916	2.42889	0.694
Ayeyarwaddy	0.6028135	0.3606254	1.00765	0.053	1.081547	0.5686131	2.057189	0.809
Naypyitaw	0.8093038	0.5188033	1.262468	0.348	0.5976147	0.2742415	1.302295	0.193
Highest Educational Status								
No Formal Education	Ref				Ref			
Primary	0.9969074	0.5748765	1.728761	0.991	1.25865	0.7212307	2.196523	0.415
Secondary	0.923249	0.5505664	1.548203	0.760	1.322484	0.7063417	2.476086	0.379
Higher	0.8297145	0.4734393	1.454096	0.511	0.9428715	0.4966776	1.789907	0.856
Marital Status								
Single	Ref				Ref			
Married	1.706656	1.134786	2.566718	**0.011**	1.307464	0.7423622	2.302732	0.350
Separated/ Divorced/ Widowed	1.403443	0.859922	2.2905	0.173	0.784481	0.4185441	1.47036	0.445
Currently employment								
No	Ref				Ref			
Yes	1.1686	0.883859	1.545072	0.271	1.423277	1.082964	1.870529	**0.012**
Wealth index								
Poorest	Ref				Ref			
Poorer	1.637195	0.8456568	3.169616	0.142	1.029602	0.2450144	4.326606	0.968
Middle	1.575722	0.759095	3.270869	0.220	2.615763	0.9747	7.0191	0.056

		2				966	22	
Richer	2.159063	1.090346	4.275298	**0.028**	3.797769	1.368644	10.5382	**0.011**
Rich	2.366448	1.198188	4.673787	**0.014**	4.987571	1.715419	14.50133	**0.004**
Parity								
0	Ref				Ref			
1	1.324264	0.8217526	2.134067	0.246	1.606277	0.8523954	3.026912	0.141
2	1.156168	0.7296707	1.831955	0.533	1.465602	0.8190305	2.622598	0.196
3	1.479512	0.9000301	2.432093	0.121	1.931239	1.092153	3.41498	**0.024**
3+	1.097445	0.674996	1.784286	0.705	1.970916	1.069589	3.631777	**0.030**
Frequency of watching TV								
Not at all	Ref				Ref			
Less than once a week	0.9481362	0.5617306	1.600344	0.841	0.9481362	0.5617306	1.600344	0.841
At least once a week	1.1173	0.7381243	1.69126	0.597	1.1173	0.7381243	1.69126	0.597

Supplementary Table 3: Adjusted odds ratios for factors associated with overweight and obesity compared to normal weight for rural area among women of Myanmar, MDHS 2015-16.

Variable	Overweight (23≥ BMI <27.5)				Obesity (BMI ≥27.5)			
Age Group (years)	Adjusted RRR	95% CI		*p*-value	Adjusted RRR	95% CI		*p*-value
		Lower Limit	Upper Limit			Lower Limit	Upper Limit	
15-24	Ref				Ref			
25-34	1.993053	1.645366	2.414212	**<0.0001**	2.662185	1.766248	4.012592	**<0.0001**
35-49	2.837788	2.322254	3.467769	**<0.0001**	4.037205	2.637831	6.17895	**<0.0001**
Region of Residence								
Kachin	Ref				Ref			
Kayah	0.8581715	0.5276925	1.39562	0.536	0.512983	0.2832599	0.9290107	**0.028**
Kayin	0.8802213	0.5669098	1.366689	0.569	0.8355287	0.5274436	1.323569	0.443
Chin	0.5510667	0.3355356	.905044	**0.019**	0.1779341	0.0820571	0.3858356	**<0.0001**
Sagaing	0.9185937	0.583784	1.445422	0.713	0.8014693	0.5151804	1.246851	0.325
Taninthayi	1.242773	0.8108307	1.904818	0.317	1.292552	0.819649	2.038299	0.268
Bago	0.7871062	0.5175211	1.197123	0.262	0.6241537	0.3969461	0.9814123	**0.041**
Magway	0.7377705	0.4743426	1.147494	0.176	0.4485698	0.2820159	0.7134876	**0.001**
Mandalay	0.6591658	0.4166751	1.042778	0.075	0.4312958	0.2610264	0.7126332	**0.001**
Mon	0.9603201	0.5975	1.543456	0.867	1.121258	0.7191246	1.748264	0.612
Rakhine	0.7224051	0.447117	1.167186	0.183	0.4226528	0.2468	0.72356	**0.002**

		2				825	45	
Yangon	1.331271	0.8092288	2.190087	0.259	0.8599715	0.5528334	1.337747	0.502
Shan	0.8526008	0.5260128	1.381959	0.516	0.8601828	0.54825	1.349593	0.511
Ayeyarwaddy	0.8402438	0.5428969	1.300449	0.434	0.7797158	0.4609332	1.318969	0.352
Naypyitaw	0.7125468	0.4415127	1.149962	0.165	0.5826169	0.361018	.940237	**0.027**
Highest Educational Status								
No Formal Education	Ref				Ref			
Primary	1.155671	0.9430101	1.416289	0.163	1.475255	1.106383	1.967109	**0.008**
Secondary	1.25736	0.9547805	1.655829	0.103	1.410123	0.9838434	2.0211	0.061
Higher	1.028378	0.6934133	1.525153	0.889	1.541224	0.9218403	2.57677	0.099
Marital Status								
Single	Ref				Ref			
Married	1.446478	1.084623	1.929057	**0.012**	2.684179	1.612273	4.468732	**<0.0001**
Separated/ Divorced/ Widowed	0.8678572	0.6071867	1.240436	0.436	1.35682	0.7291331	2.524863	0.334
Currently employment								
No	Ref				Ref			
Yes	1.011636	0.8893111	1.150787	0.860	0.9643305	0.7881907	1.179833	0.723
Wealth index								
Poorest	Ref				Ref			
Poorer	1.467707	1.218223	1.768285	**<0.0001**	1.534762	1.138391	2.069144	**0.005**
Middle	1.943905	1.577616	2.395239	**<0.0001**	2.15362	1.5570	2.97882	**<0.0001**

						2		
Richer	1.933188	1.529228	2.443857	**<0.0001**	2.907661	2.09556	4.03448	**<0.0001**
Rich	2.326294	1.669484	3.241508	**<0.0001**	4.025519	2.657761	6.097162	**<0.0001**
Parity								
0	Ref				Ref			
1	1.529117	1.149527	2.034053	**0.004**	1.450185	0.8730671	2.408791	0.151
2	1.553539	1.143311	2.110961	**0.005**	1.755926	1.041618	2.960084	**0.035**
3	1.731549	1.254656	2.389708	**0.001**	1.762302	1.03753	2.993367	**0.036**
3+	1.367349	0.9952458	1.878574	**0.054**	1.480344	0.8671131	2.527257	0.150
Frequency of watching TV								
Not at all	Ref				Ref			
Less than once a week	0.9466965	0.7716262	1.161488	0.598	1.054994	0.8013967	1.388841	0.702
At least once a week	1.040453	0.8908021	1.215246	0.616	1.399062	1.11264	1.759217	**0.004**

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Title of the study: **Frequency of Television viewing and prevalence of overweight and obesity among women of the reproductive age group in Myanmar: Results from a nationwide survey**

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3-4
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	6-8
Objectives	3	State specific objectives, including any prespecified hypotheses	7-8
Methods			
Study design	4	Present key elements of study design early in the paper	8-9
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	8-9
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8-9
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	10-12
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-10
Bias	9	Describe any efforts to address potential sources of bias	12
Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	12-13
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	12-13
		(*b*) Describe any methods used to examine subgroups and interactions	12-13

		(*c*) Explain how missing data were addressed	12-13
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	14
		(b) Give reasons for non-participation at each stage	Not applicable
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	14
		(b) Indicate number of participants with missing data for each variable of interest	14
Outcome data	15*	Report numbers of outcome events or summary measures	17
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	20
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	22
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	24
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	22-24
Generalisability	21	Discuss the generalisability (external validity) of the study results	22-24
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	26

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Frequency of Television viewing and association with overweight and obesity among women of the reproductive age group in Myanmar: Results from a nationwide cross-sectional survey

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Keywords:	Obesity, Overweight, Noncommunicable Disease, Myanmar

Title: Frequency of Television viewing and association with overweight and obesity among women of the reproductive age group in Myanmar: Results from a nationwide cross-sectional survey

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ABSTRACT

Objectives: This study aimed to discern the association between the frequency of television viewing and overweight/obesity among reproductive age women of Myanmar.

Design: This was a cross-sectional study.

Setting: This study used Myanmar Demographic and Health Survey (2015-16) data.

Participants: Total of 12,021 women both aged 15-49 years and also not pregnant or did not deliver a child within the two months prior to the survey were included.

Primary and secondary outcome measures: The primary outcome was overweight (23.0 to <27.5 kg/m^2) and obesity (≥27.5 kg/m^2), which was measured using the Asian BMI cut off. Ordered logistic regression analysis was conducted to find the association between the explanatory and outcome variables.

Results: The prevalence of overweight was 26.5% and obesity was 12.2% among the study participants. The odds of being overweight/obese were 20% higher (adjusted odds ratio (AOR): 1.16, 95% CI: 1.02-1.32; *p*-value = 0.023) among those who watched television at least once a week compared to those who did not watch television at all.. Rural women who watched television at least once a week were 1.2 times more likely to be obese (AOR: 1.16, 95% CI: 1.01-1.34; *p*-value = 0.040) compared to those who did not watch television at all.

Conclusions: Frequent television watching was associated with obesity among rural women of reproductive age in Myanmar.

Key words: Obesity, Overweight, Non-communicable Disease, Myanmar

STRENGTHS AND LIMITATIONS OF THE STUDY

- This study utilized a nationally representative sample to investigate the association between the frequency of television viewing and overweight/obesity among women of reproductive age from Myanmar.
- This study utilized standard and valid tools for data collection. The probability of the existence of measurement error is lower in this study in comparison to other cross-sectional studies conducted in Myanmar.
- Temporal relationship could not be established due to cross-sectional nature of the survey.
- The frequency of television viewing was measured in weeks, not in days/hours; the latter could have given more precise information.
- In the multivariable analysis, food habit and duration of physical activity were not included because that information was not collected in the survey.

INTRODUCTION

Both developed and developing countries are facing the increasing burden of overweight and obesity, which are posing as major public health problems.[1-3] The prevalence of overweight and obesity increased by 27.5% among the global adult population and 47.1% among the global child population between 1980 and 2013.[4] During the same time period, globally, the prevalence of overweight and obesity rose from 29.8% to 38.0% among adult females, in particular.[4] Although this burden is lowest in South and Southeast Asia, countries of this region are still experiencing the rising burden of overweight and obesity.[5] Myanmar is a low and middle-income country (LMIC) situated in the Southeast Asia region. In 2015-16, the first Myanmar Demographic and Health Survey (MDHS) was conducted using a nationally representative sample across the country.[6] The survey found a high prevalence of overweight and obesity among women of reproductive age.[7]

Overweight and obesity is an important risk factor for the development of several non-communicable diseases (NCDs) like diabetes mellitus [8], hypertension[9], cardiovascular diseases [10], cancer[11] and chronic kidney diseases .[12] In addition, overweight and obese women experience complications during pregnancy (gestational diabetes mellitus, pre-eclampsia and eclampsia) more frequently than women of normal body weight.[13 14]

It has been found that energy expenditure is very low among people who spend their leisure time watching television, rather than being involved in physical activities like playing games, gardening, etc. This ultimately increases their risk of gaining excessive body weight.[15 16] Television watching is also associated with an increase in energy intake, which may sometimes

be attributable to their frequent exposure to television advertisements of foods and beverages and the subsequent consumption of said foods and beverages.[17-21]

Across the world, many studies have shown a positive association between the increased frequency of television viewing and overweight/obesity. In the USA and Australia, it has been found that people who view television more frequently are at higher risk of being overweight/obese.[20 22-24] A study from Bangladesh has found that watching television frequently (at least once a week) was associated with obesity among women of reproductive age.[25] However, this association has not been explored in other South and Southeast Asian countries including Myanmar. Therefore, this study was conducted to determine the association between television viewing and the prevalence of overweight and obesity among women of reproductive age in Myanmar using the MDHS 2015-16 data.

METHODS

study settings

According to the 2014 census, the total population of Myanmar was 51.5 million with a population density of 76 persons per square kilometer (km^2). The country is home to 135 ethnic groups.[26 27] The *Gross Domestic Product* (*GDP*) growth rate of Myanmar was 6.4% and per capita, Gross National Income (GNI) was 1,455 USD in 2016-17. More than a quarter (26.1%) of the population was living under the poverty line in 2014. Myanmar also has the lowest life expectancy at birth (66.6 years) among the Association of Southeast Asian Nations (ASEAN). [26 28]

study design

This study analyzed the data of MDHS 2015-16, the first Demographic and Health Survey of Myanmar.[6] The detailed method has been published previously.[6] MDHS 2015-16 was a cross-sectional survey which used a nationally representative sample and was conducted through a joint collaboration between the Ministry of Health and Sports of Myanmar and ICF International. The United States Agency for International Development (USAID) and Three Millennium Development Goal Fund (3MDG) provided financial support for the survey. Two-stage cluster sampling techniques were used for sample selection. The sample was stratified for each of the seven states and eight regions of Myanmar. At the first stage, 442 clusters (urban: 123 and rural: 319) were selected randomly from a sample frame of 4,000 clusters. At the second stage, 30 households were selected from each of the clusters. In total, 13,260 households were selected for the final sample. The target group of this study was women of reproductive age (15-49 years). The permanent residents and the visitors who stayed in the selected households the night before the date of data collection were included in the questionnaire survey. Around 96% of eligible women agreed to participate in the survey. Among them, 98% agreed for anthropometric measurement. However, pregnant women and women who had given birth within the preceding two months of the survey were excluded. The final weighted sample size of this study was 12,021 (Figure 1**).**

survey tools and data collection

A standard woman's questionnaire used by the DHS program was adopted and modified according to the local context and pre-tested to collect the socio-demographic information (e.g. age, sex, household wealth index and place of residence) through face-to-face interviews.

Trained field staff carried out the interviews and anthropometric measurements. Measuring boards specially made by Shorr Productions were used for height measurement and lightweight SECA scales with digital screens were used for measuring the weight of the respondents.

The main outcome variables of this study were overweight and obesity. To define these variables, an Asia specific body mass index (BMI) cut-off value was used.[29] Women having a BMI <23.0 kg/m^2 were considered to be normal weight or underweight, women having a BMI between 23.0 kg/m^2 and <27.5 kg/m^2 were considered to be overweight and women having a BMI ≥27.5 kg/m^2 were considered to be obese.

The main explanatory variable of interest for this study was the frequency of viewing television. Data were collected as the following categories: (1) not viewing television at all, (2) viewing television less than once a week, and (3) viewing television at least once a week.[10] The other independent variables considered based on the literature review were age group, place of residence, region of residence, education, wealth quintile, current working status, parity and number of household members in the family. The categories of the variables are mentioned in Table 1.

Table 1: List of variables considered for the study

Name of the Variables	**Categories**
Outcome Variables:	
Body Mass Index (BMI)	a) 0= Normal weight or underweight (BMI <23 kg/m^2) b) 1= Overweight (BMI 23.0 kg/m^2 to <27.5 kg/m^2) c) 2= Obesity (BMI ≥27.5 kg/m^2)

Explanatory Variable:	
Frequency of Viewing Television	a) 0= Not at all b) 1= Less than once a week c) 2= At least once a week
Covariates:	
1. Age Groups	a) 0= 15-24 years b) 1= 25-34 years c) 2= 35-49 years
2. Place of Residence	a) 0= Urban b) 1= Rural
3. Region of Residence	a) 0= Kachin b) 1= Kayah c) 2= Kayin d) 3= Chin e) 4= Sagaing f) 5= Taninthayi g) 6= Bago h) 7= Magway i) 8= Mandalay j) 9= Mon k) 10= Rakhine l) 11= Yangon

	m) 12= Shan n) 13= Ayeyarwaddy o) 14= Naypyitaw
4. Education	a) 0= No education b) 1= Primary education c) 2= Secondary education d) 3= Higher education
5. Wealth quintile	a) 0= Poorest b) 1= Poorer c) 2= Middle d) 3= Richer e) 4= Richest
6. Current working status	a) 0= Yes b) 1= No
7. Parity	a) 0= 0 (nullipara) b) 1= 1 (primipara) c) 2= 2 d) 3= 3 e) 4= >3
8. Number of Household Members	a) 0= ≤5 b) 1= >5

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data analysis

Weighted descriptive statistics (frequency and percentage) were used to present the socio-demographic characteristics of the respondents. A chi-square (χ^2) test was performed to determine whether the groups differed in terms of the explanatory variables according to the BMI status. To find the association between the explanatory and outcome variables, ordered logistic regression analysis was conducted. Initially, bivariate analyses were done. Variables which showed a *p-value* <0.20 in bivariate analyses were included in the multivariable model. This value of 0.2 was considered significant to prevent residual confounding in multivariable analysis.[30] The variables which showed *p*-value <0.05 in multivariable analysis were considered to be statistically significant. Both the unadjusted Crude Odd Ratio (COR) and Adjusted Odds Ratio (AOR) were reported. Variance inflation factors (VIF) were assessed to check multicollinearity among the variables; however, no significant multicollinearity was observed. A test for interaction effect between the frequency of TV viewing and the place of residence was performed; however, no significant interaction effect was observed. The cluster effect was adjusted during analysis. All the analyses was done using Stata 13.0. The authors followed the guidelines outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (*STROBE*) statement in writing the manuscript (Supplementary File 1).

ethical consideration

MDHS received ethical approval from the Ethics Review Committee on Medical Research including Human Subjects in the Department of Medical Research, Ministry of Health and Sports as well as from the ICF Institutional Review Board. Written informed consent was

taken from the participants. In case of minor participants, assent form was signed by the respondents and written informed consent was given by the adult guardian.

patient Involvement

Patients were not involved in the study.

FINDINGS

socio-demographic characteristics of the respondents

The data of 12,021 weighted samples were analyzed. More than a quarter (26.5%) of the study participants were overweight, and 12.2% of them were obese (Figure 2). The socio-demographic characteristics of the respondents along with the prevalence of the three categories of BMI across the independent variables with the associated chi-square ($\chi 2$) value are presented in Table 2. The majority of the study participants was aged between 35 and 49 years (42.3%) and was residing in the rural area (70.8%). The highest proportion of participants was from the Yangon Region (15.1%), followed by the Ayeyarwaddy Region (12.5%) and the Mandalay Region (12.2%), whereas the lowest participation was from the Kayah Region (0.5%). Around half of the respondents (41.3%) were educated up to the primary level and about one-third (36.1%) received secondary level education; furthermore, 10.2% received higher education and 12.4% received no education. More than two-thirds (68.1%) of the women were employed at the time of interview. Nearly two-fifths of the women (41.7%) were nulliparous, while cumulatively a similar proportion of respondents (46.6%) had the experience of being pregnant- once (15.3%), twice (15.8%), thrice (11.7%) and more than three times (15.5%). The highest proportion of the

respondents belonged to the richest wealth quintile (22.2%) followed by richer (21.1%) and middle (20.9%) quintile. Among the study participants, the majority (60.1%) reported that they watched television at least once a week; however, 23.1% did not watch television at all and 16.8% watched television less than once a week. Except for current employment status, significant differences were found among the BMI of women across the explanatory variables. The prevalence of overweight and obesity increased with age (p-value <0.0001) and was the most common in the Yangon and Kachin Region (p-value <0.0001). This prevalence was also higher in the urban areas compared to the rural areas (overweight: 31.1% versus 24.6%; obesity: 17.9% versus 9.8%; p-value <0.0001). Plausibly, Women with higher educational status, having two children and belonging to the richest wealth group had a higher prevalence of overweight and obesity (p-value <0.0001). The prevalence of overweight and obesity was also higher among the individuals who used to watch television at least once a week (p-value <0.0001) (Table 2).

Table 2: Socio Demographic characteristics of the study participants and prevalence of overweight and obesity across the independent variables, MDHS 2015-16 (N= 12,021)

Variable	Frequency (%)	BMI Status (%)			$\chi 2$	*p*-value
		BMI <23	23≥ BMI <27.5	BMI ≥27.5		
Age Group (years)						
15-24	3433 (28.6)	82.4	14.3	3.3	173.9	**<0.0001**
25-34	3504 (29.1)	60.4	27.6	12.0		
35-49	5084 (42.3)	47.7	34.0	18.3		
Place of Residence						
Urban	3505 (29.2)	51.0	31.1	17.9	258.4	**<0.0001**
Rural	8516 (70.8)	65.6	24.6	9.8		
Region of Residence						
Kachin	334 (2.8)	54.6	30.0	15.4	240.1	**<0.0001**
Kayah	60 (0.5)	63.3	27.1	9.6		
Kayin	274 (2.3)	59.1	27.1	13.8		
Chin	90 (0.8)	71.7	23.9	4.4		
Sagaing	1351 (11.3)	58.7	27.7	13.6		
Taninthayi	265 (2.2)	57.0	28.6	14.4		
Bago	1197 (9.9)	64.5	25.9	9.6		
Magway	1030 (8.6)	67.7	24.0	8.3		
Mandalay	1462 (12.2)	64.2	25.4	10.5		

Mon	432 (3.6)	59.7	25.0	15.3		
Rakhine	695 (5.8)	75.3	19.2	5.5		
Yangon	1822 (15.1)	49.7	33.8	16.5		
Shan	1216 (10.1)	60.2	25.7	14.1		
Ayeyarwaddy	1508 (12.5)	64.8	23.3	11.8		
Naypyitaw	285 (2.3)	63.3	26.0	10.7		
Highest Educational Status						
No Formal Education	1485 (12.4)	65.4	25.3	9.3	40.5	**0.0003**
Primary	4966 (41.3)	59.8	27.6	12.6		
Secondary	4345 (36.1)	63.1	25.3	11.6		
Higher	1225 (10.2)	56.6	28.1	15.3		
Currently Employed						
Yes	8184 (68.1)	61.2	26.6	12.2	0.2	0.9348
No	3837 (32.9)	61.6	26.4	12.0		
Wealth index						
Poorest	2052 (17.1)	75.2	18.6	6.2	427.7	**<0.0001**
Poorer	2252 (18.7)	66.8	25.0	8.2		
Middle	2509 (20.9)	61.5	28.0	10.5		
Richer	2533 (21.1)	57.2	28.2	14.6		
Richest	2675 (22.2)	49.9	30.9	19.2		
Marital Status						
Single	4191 (34.9)	76.8	17.4	5.8	120.1	**<0.0001**
Currently Married	7021 (58.4)	52.1	31.9	16.0		
Separated/Divorced/Widowed	809 (6.7)	61.1	27.4	11.5		
Parity						
0	5010 (41.7)	75.2	18.4	6.4	759.6	**<0.0001**
1	1844 (15.3)	55.5	30.8	13.7		

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2	1903 (15.8)	49.4	32.7	17.9		
3	1405 (11.7)	45.6	36.1	18.3		
>3	1859 (15.5)	54.0	30.4	15.6		
Number of Household Member						
≤5	7402 (61.6)	59.8	27.2	13.0	7.4	**<0.001**
>5	4620 (38.4)	63.9	25.5	10.6		
Frequency of Viewing Television						
Not at all	2779 (23.1)	67.2	24.5	8.3	89.7	**<0.001**
Less than once a week	2015 (16.8)	63.3	25.9	10.8		
At least once a week	7227 (60.1)	58.5	27.5	14.0		

The frequency of watching television at least once a week was higher among the urban women than the rural women (80.8% versus 51.7%). Around 30% of the rural women did not view television at all, whereas the proportion was lower for the urban women (7.2%) (Figure 3).

association between the frequency of viewing television and overweight and obesity

Ordered logistic regression was used to discern the association between the frequency of viewing television and overweight and obesity. During the analyses, the normal weight category (BMI < 23 kg/m^2) was held as the reference group. The results are presented in Table 3. In the final model after adjusting for age, place and region of residence, wealth index, highest educational status, current employment status, parity and number of household members, it was found that, women who watched television at least once a week were 1.2 times more likely to be overweight/obese than the women who never watched television (AOR: 1.16 , 95% CI: 1.02-1.32; *p*-value=0.023).

When stratified by urban and rural residence, overweight/obesity showed significant association with the frequency of viewing television in the urban areas. However, in the rural areas, women who watched television at least once a week were 1.2 times more likely to be overweight/obese than those who did not watch television at all (AOR: 1.16, 95% CI: 1.01-1.34; *p*-value=0.040) (Table 3).

The final logistic regression models are shown in supplementary table 1-3 (supplementary file 2).

Table 3: Association between the frequency of viewing Television and overweight and obesity among reproductive age women of Myanmar, MDHS* 2015-16

Frequency of viewing Television				
	COR**(95% CI***)	*p*-value	AOR****(95% CI***)	*p*-value
Total:				
Not at all	Ref		Ref	
Less than once a week	1.20 (1.03-1.40)	**0.020**	1.01 (0.87-1.19)	0.870
At least once a week	1.49 (1.32-1.69)	**<0.001**	1.16 (1.02- 1.32)	**0.023**
In Urban Area:				
Not at all	Ref		Ref	
Less than once a week	1.15 (0.80-1.67)	0.441	1.05 (0.73-1.51)	0.779
At least once a week	1.25 (0.93-1.69)	0.144	1.14(0.85-1.52)	0.389
In Rural Area:				
Not at all	Ref		Ref	
Less than once a week	1.11 (0.93-1.32)	0.242	0.98 (0.82-1.17)	0.829
At least once a week	1.26 (1.10-1.44)	**0.001**	1.16 (1.01-1.34)	**0.040**

* *MDHS: Myanmar Demographic and Health Survey*

** *COR: Crude Odds Ratio*

*** *CI: Confidence Interval*

**** *AOR: Adjusted Odds Ratio*

Results are based on ordered logistics regression and adjusted for age, place of residence, region of residence, highest educational status, current employment status, wealth index, parity and number of household members. BMI <23 group was held as the reference group.

model goodness-of-fit: To assess the internal validity of the regression model, the F-adjusted mean residual goodness-of-fit test was used. The *p*-value of the F statistics of the adjusted model was <0.001, indicating an acceptable model fitness.

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DISCUSSION

To the best of our knowledge, this is the first study to utilize a nationally representative sample to examine the association between frequency of television viewing with the prevalence of overweight and obesity among women of reproductive age in Myanmar. More than one fourth of the women surveyed were overweight and one in eight women was obese. This study also found that watching television at least once a week was significantly associated with overweight/obesity in women of reproductive age in rural Myanmar.

The prevalence of overweight and obesity among women of reproductive age was found to be 26.5% and 12.2% respectively. The total burden of overweight/obesity (38.7%) was almost similar to the burden of overweight/obesity among the same target group in other South and Southeast Asian countries, including Nepal (32.8%)[31], Bangladesh (36%)[3] and Pakistan (39%).[32] Each of these studies utilized a nationally representative sample and the Asian BMI cutoff.

The prevalence of overweight and obesity was higher among the women living in the urban areas compared to those living in the rural areas. This finding is consistent with studies done in other South and Southeast Asian countries, including Bangladesh, as well as in the other continents.[3 25 33-35] Urban women had a higher frequency of television watching. This may be due to the higher coverage of electricity and the availability of many satellite channels in urban areas in comparison to rural areas.[25]

It was found that among rural women, the prevalence of overweight/obesity was significantly associated with watching television at least once a week. This finding is also consistent with the finding from Bangladesh.[25]

Despite the frequency of television watching among urban women, there was no association between this behavior and the prevalence of overweight/obesity. However, they were more likely to be overweight/obese than rural women. A propensity towards a more sedentary lifestyle and the intake of high-calorie foods by the urban residents may be potential determinants that have overridden the effect from an increased frequency of watching television. On the other hand, reliance on less developed transportation facilities, involvement in more laborious work and comparatively lower consumption of obesogenic diets among the rural women are factors that may contribute to a lower prevalence of overweight/obesity.[25] Those who view television more frequently in the rural area are more prone to lead a sedentary lifestyle and as such are at greater risk of developing obesity.[25]

The findings from our study are coherent with a recent study in Bangladesh, which showed a positive association between the frequency of television viewing and overweight/obesity in women of reproductive age.[25] Similar positive associations were also found in developed countries (e.g. USA and Australia).[20 22-24] In a recently published multi-country study, this association has also been observed in the case of children and adolescents.[36]

Policy and Program Implications

The high prevalence of overweight/obesity is associated with an increased burden from NCDs in Myanmar, as shown in recent evidence.[7 37] An unintended consequence of the continuing economic development of the country is the increasing preference for a sedentary lifestyle and obesogenic food, which, in turn, is raising the burden of overweight/obesity. Considering the epidemiologic, demographic, and nutritional transition, the policymakers of Myanmar should focus on the prevention and control of both overweight/obesity and NCDs. The

newly released 'Myanmar National Health Plan 2017-2021' incorporates NCD prevention and control programs.[38] Furthermore, a Social Behavioral Change Communication (SBCC) campaign should be developed in order to promote physical activity and raise awareness among the population, especially among children and adolescents, in order to prevent overweight/obesity as early as possible. Further research should be conducted among men and adolescents to determine whether this positive association exists among those target population as well.

STRENGTHS AND LIMITATIONS

This is the first study, which utilized a nationally representative sample to examine the association between the frequency of watching television and overweight/obesity among women of reproductive age in Myanmar. Moreover, as MDHS utilized standard and valid tools for data collection, the probability of the existence of any measurement error is lower in this study in comparison to other cross-sectional studies conducted in Myanmar. However, the survey could not establish the temporal relationship between the exposure and the outcome variables because of its cross-sectional design. The frequency of television viewing was measured in weeks, as opposed to days/hours; the latter could have given more precise information. In the multivariable analysis, food habit and duration of physical activity were not included because this information was not collected in MDHS. There may be the presence of reporting bias while measuring the frequency of television watching. The information related to the frequency of time spent on other types of telecommunication devices such as mobile phones or computers was not collected, so the association with those variables with overweight/obesity could not be measured.

CONCLUSIONS

The rising burden of overweight and obesity is now a global concern. Obesity ultimately leads towards the development of NCDs and premature death. The results from this study demonstrate that watching television is associated with obesity among reproductive age women in Myanmar. Therefore, necessary steps should be taken to improve awareness regarding the harmful consequences of watching TV for longer hours and physical inactivity as well as to encouragement of increased physical activity. Additional research is also warranted to explore the situation among the general population of Myanmar.

LIST OF ABBREVIATION

ASEAN- Association of Southeast Asian Nations

BMI- Body Mass Index

GDP- *Gross Domestic Product*

GNI- Gross National Income

NCDs- Non-Communicable Diseases

MDHS- Myanmar Demographic and Health Survey

SBCC- Social Behavioral Change Communication

SEARO- South-East Asia Regional Office

USAID- United States Agency for International Development

USD- United States Dollar

WHO- World Health Organization

3MDG- Three Millennium Development Goal Fund

Contributors

RDG, IHS, MH, IS and MS conceptualized the study. RDG, IHS, MH, IS, MRH and MS designed the study and acquired the data. RDG, IHS, MH and IS conducted the data analysis. RDG, IHS, MH, IS, MRH and MS interpreted the data. RDG, IHS, MH, IS and MRH prepared the first draft. RDG, IHS, MH, IS, MRH and MS participated in critical revision of the manuscript and contributed to its intellectual improvement. All authors went through the final draft and approved it for submission. RDG, IHS, MH and IS equally contributed in this work as first author.

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Competing Interests

None declared.

Patient Consent

None Declared

Disclaimer

The authors are alone responsible for the integrity and accuracy of data analysis and the writing the manuscript.

Ethics Approval

The datasets were obtained from DHS Programme with proper procedure. The study exempt from collecting ethical approval because the survey protocols were reviewed and approved by Ethics Review Committee on Medical Research including Human Subjects in the Department of Medical Research, Ministry of Health and Sports as well as from the ICF Institutional Review Board.

Data Sharing Statement

The dataset of MDHS 2015-16 is available at the Demographic and Health Surveys Program. Extra data is available which is available on request at http://dhsprogram-com/what-we-do/survey/survey-display-349.cfm

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Figures:

Figure 1: Flowchart showing the process of selecting the participants in the survey

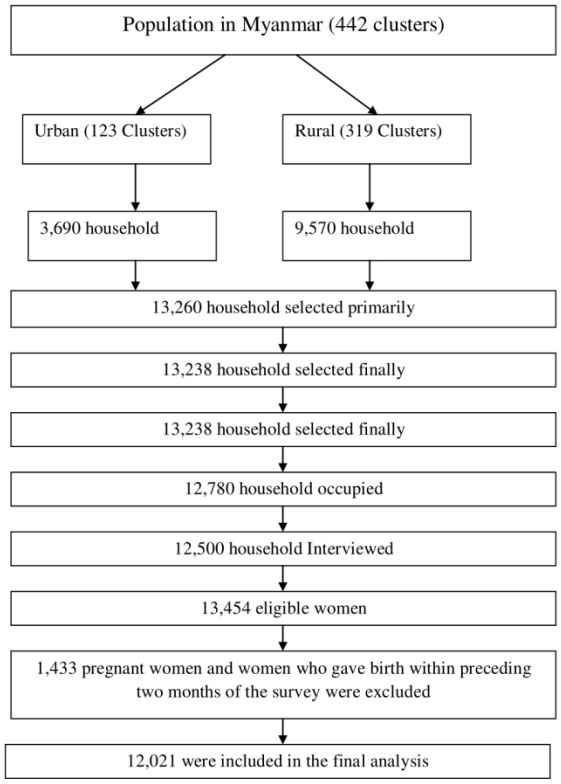
Figure 2: Distribution of the respondents by BMI status

Figure 3: Distribution of the respondents by place of residence with frequency of watching television

Supplementary Materials:

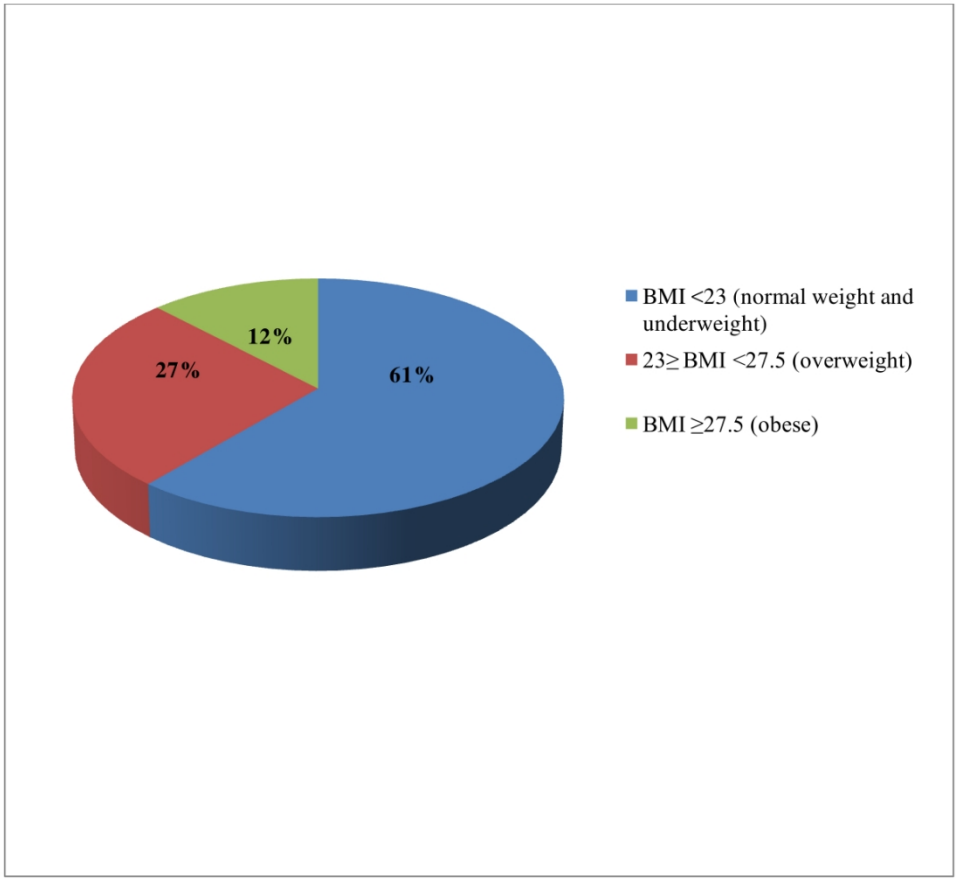
Supplementary File 1: STROBE Checklist

Supplementary File 2: Supplementary Tables



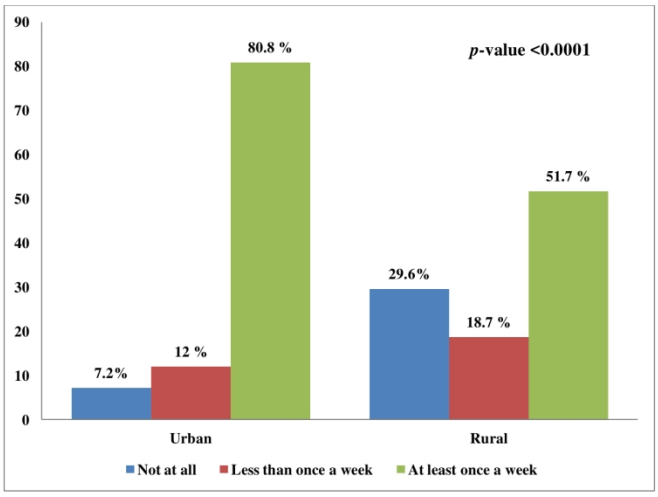
Flowchart showing the process of selecting the participants in the survey

143x186mm (300 x 300 DPI)



Distribution of the respondents by BMI status

334x317mm (96 x 96 DPI)



Distribution of the respondents by place of residence with frequency of watching television

143x186mm (300 x 300 DPI)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Title of the study: **Frequency of Television viewing and association with overweight and obesity among women of the reproductive age group in Myanmar: Results from a nationwide cross-sectional survey**

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7-8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-10
Bias	9	Describe any efforts to address potential sources of bias	11
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	11
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	11
		(*b*) Describe any methods used to examine subgroups and interactions	11

		(*c*) Explain how missing data were addressed	11
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	7
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	12-13
		(b) Indicate number of participants with missing data for each variable of interest	7
Outcome data	15*	Report numbers of outcome events or summary measures	12-19
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	17-19
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	20
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	22
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20-22
Generalisability	21	Discuss the generalisability (external validity) of the study results	22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	24

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Supplementary Tables

Supplementary Table 1: Crude and Adjusted odds ratios for factors associated with overweight and obesity compared to normal weight among women of Myanmar, MDHS 2015-16.

Variable	Crude Odds Ratio (COR)	95% CI	*p*-value[1]	Adjusted Odds Ratio (AOR)	95% CI	*p*-value[1]
Age Group (in years)						
15-24	Ref			Ref		
25-34	3.11	2.73-3.54	**<0.001**	2.34	2.01-2.73	**<0.001**
35-49	5.21	4.66 - 5.83	**<0.001**	3.65	3.14-4.26	**<0.001**
Place of Residence						
Urban	Ref			Ref		
Rural	0 .54	0.47-0.61	**<0.001**	0.74	0.64-0.87	**<0.001**
Region of Residence						
Kachin	Ref			Ref		
Kayah	0.68	0.49-0.94	**0.019**	0.68	0.50-0.92	**0.012**
Kayin	0.84	0.64-1.10	0.202	0.88	0.69-1.12	0.301
Chin	0.45	0.33-0.61	**<0.001**	0.50	0.38-0.66	**<0.001**

Sagaing	0.85	0.65-1.11	0.234	0.88	0.67-1.15	0.343
Taninthayi	0.91	0.70-1.17	0.459	1.03	0.78-1.36	0.832
Bago	0.65	0.51-0.82	**<0.001**	0.68	0.54-0.87	**0.002**
Magway	0.56	0.43-0.74	**<0.001**	0.60	0.45-0.77	**<0.001**
Mandalay	0.67	0.52-0.87	0.002	0.64	0.50-0.82	**<0.001**
Mon	0.84	0.64-1.11	0.217	0.87	0.67-1.20	0.381
Rakhine	0.39	0.29-0.52	**<0.001**	0.61	0.45-0.82	**0.001**
Yangon	1.18	0.90-1.55	0.224	0.98	0.75-1.27	0.854
Shan	0.81	0.60-1.09	0.165	0.91	0.68-1.20	0.486
Ayeyarwaddy	0.66	0.50-0.88	0.005	0.81	0.61-1.08	0.152
Naypyitaw	0.69	0.53-0.90	0.006	0.68	0.52-0.90	**0.008**
Highest Educational Status						
No Formal Education	Ref			Ref		
Primary	1.29	1.13-1.48	**<0.001**	1.24	1.06-1.45	**0.006**
Secondary	1.13	0.97-1.32	0.115	1.26	1.04-1.53	**0.018**
Higher	1.50	1.22-1.83	**<0.001**	1.10	0.86-1.40	0.452
Currently employment						
No	Ref					

Yes	1.02	0.91-1.13	0.762			
Wealth index						
Poorest	Ref			Ref		
Poorer	1.49	1.29-1.72	**<0.001**	1.46	1.27-1.72	**<0.001**
Middle	1.87	1.61-2.18	**<0.001**	1.92	1.62-2.28	**<0.001**
Richer	2.31	1.97-2.72	**<0.001**	2.26	1.83-2.72	**<0.001**
Rich	3.16	2.68-3.72	**<0.001**	2.82	2.28-3.48	**<0.001**
Marital Status						
Single	Ref			Ref		
Married	3.03	2.73-3.37	**<0.001**	1.60	1.30-1.98	**<0.001**
Separated/ Divorced/ Widowed	2.10	1.75-2.51	**<0.001**	1.03	0.80-1.32	0.820
Parity						
0	Ref			Ref		
1	2.42	2.13-2.75	**<0.001**	1.44	1.15-1.81	**0.002**
2	3.13	2.73-3.59	**<0.001**	1.50	1.19-1.88	**0.001**
3	3.53	3.07-4.06	**<0.001**	1.61	1.29-2.02	**<0.001**

3+	2.62	2.30-2.99	**<0.001**	1.42	1.13-1.79	**0.003**
Number of Household Member						
≤5	Ref			Ref		
>5	0.83	0.76-0.92	**<0.001**	0.92	0.83-1.03	0.150
Frequency of watching TV						
Not at all	Ref			Ref		
Less than once a week	1.20	1.03-1.40	**0.020**	1.01	0.87-1.19	0.870
At least once a week	1.49	1.32-1.69	**<0.001**	1.16	1.02-1.32	**0.023**

MDHS: Myanmar Demographic and Health Survey

CI: Confidence Interval

[1] *Variable with p-value less than <0.2 from unadjusted model were included into multivariable analysis*

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Supplementary Table 2: Crude odds ratios for factors associated with overweight and obesity compared to normal weight for urban area among women of Myanmar, MDHS 2015-16.

Variable	Crude Odds Ratio (COR)	95% CI	*p*-value[1]	Adjusted Odds Ratio (AOR)	95% CI	*p*-value[1]
Age Group (in years)						
15-24	Ref			Ref		
25-34	3.43	2.72-4.33	**<0.001**	2.67	2.07-3.44	**<0.001**
35-49	7.63	6.32-9.21	**<0.001**	5.52	4.30-7.08	**<0.001**
Region of Residence						
Kachin	Ref			Ref		
Kayah	0.70	0.42-1.19	0.188	0.63	0.38-1.05	0.075
Kayin	0.95	0.75-1.19	0.646	0.94	0.69-1.28	0.675
Chin	0.76	0.56-1.02	0.070	0.71	0.51-0.99	**0.041**
Sagaing	0.96	0.72-1.28	0.790	0.99	0.70-1.40	0.943
Taninthayi	0.62	0.47-0.82	**0.001**	0.61	0.38-0.98	**0.042**
Bago	0.71	0.53-0.93	**0.015**	0.62	0.43-0.89	**0.010**
Magway	0.59	0.36-0.97	**0.038**	0.50	0.29-0.86	**0.013**
Mandalay	0.98	0.79-1.22	0.848	0.85	0.62-1.18	0.334

Mon	0.77	0.49-1.20	0.243	0.62	0.32-1.20	0.154
Rakhine	0.61	0.41-0.89	**0.012**	0.60	0.43-0.83	**0.002**
Yangon	1.00	0.76-1.34	0.975	1.01	0.71-1.46	0.944
Shan	1.03	0.69-1.55	0.885	1.05	0.65-1.68	0.839
Ayeyarwaddy	0.74	0.52-1.06	0.099	0.89	0.55-1.44	0.632
Naypyitaw	0.80	0.51-1.25	0.322	0.75	0.49-1.15	0.181
Highest Educational Status						
No Formal Education	Ref			Ref		
Primary	1.14	0.84-1.56	0.389	1.10	0.76-1.58	0.605
Secondary	0.78	0.57-1.06	0.107	1.13	0.76-1.68	0.530
Higher	0.84	0.59-1.20	0.346	0.92	0.61-1.40	0.704
Currently employment						
No	Ref			Ref		
Yes	1.22	1.00-1.49	**0.046**	1.29	1.06-1.56	**0.010**
Wealth index						
Poorest	Ref			Ref		
Poorer	1.35	0.76-2.37	0.302	1.44	0.69-2.99	0.330

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Middle	1.53	0.94-2.50	0.089	1.99	1.09-3.64	**0.025**
Richer	2.14	1.28-3.57	**0.004**	2.65	1.43-4.91	**0.002**
Rich	2.43	1.47-4.02	**0.001**	3.08	1.63-5.82	**0.001**
Marital Status						
Single	Ref			Ref		
Married	3.21	2.73-3.78	**<0.001**	1.46	1.01-2.11	**0.042**
Separated/ Divorced/ Widowed	2.67	2.01-3.55	**<0.001**	1.05	0.70-1.58	0.828
Parity						
0	Ref			Ref		
1	2.61	2.05-3.33	**<0.001**	1.36	0.89-2.08	0.152
2	3.21	2.60-3.96	**<0.001**	1.27	0.87-1.85	0.221
3	3.95	3.01-5.20	**<0.001**	1.50	1.03-2.18	**0.034**
3+	3.91	2.96-5.17	**<0.001**	1.44	0.97-2.14	0.072
Number of Household Member						
≤5	Ref			Ref		
>5	0.94	0.79-1.11	0.449	1.13	0.92-1.38	0.250

Frequency of watching TV*						
Not at all	Ref			Ref		
Less than once a week	1.15	0.80-1.67	0.441	1.05	0.73-1.52	0.779
At least once a week	1.25	0.93-1.69	0.144	1.14	0.85-1.52	0.389

MDHS: Myanmar Demographic and Health Survey

CI: Confidence Interval

[1] *Variable with p-value less than <0.2 from unadjusted model were included into multivariable analysis*

Supplementary Table 3: Adjusted odds ratios for factors associated with overweight and obesity compared to normal weight for rural area among women of Myanmar, MDHS 2015-16.

Variable	Crude Odds Ratio (COR)	95% CI	*p*-value[1]	Adjusted Odds Ratio (AOR)	95% CI	*p*-value[1]
Age Group (in years)						
15-24	Ref			Ref		
25-34	3.10	2.65-3.62	**<0.001**	2.09	1.75-2.51	**<0.001**
35-49	4.61	4.01-5.30	**<0.001**	2.89	2.38-3.49	**<0.001**
Region of Residence						
Kachin	Ref			Ref		
Kayah	0.70	0.46-1.06	0.091	0.71	0.48-1.06	0.091
Kayin	0.85	0.58-1.24	0.401	0.89	0.63-1.25	0.497
Chin	0.36	0.23-0.57	**<0.001**	0.43	0.28-0.64	**<0.001**
Sagaing	0.90	0.63-1.30	0.586	0.88	0.61-1.25	0.466
Taninthayi	1.10	0.77-1.56	0.606	1.25	0.88-1.78	0.206
Bago	0.68	0.49-0.94	**0.018**	0.72	0.52-0.99	**0.044**
Magway	0.62	0.44-0.87	**0.006**	0.62	0.44-0.86	**0.005**
Mandalay	0.58	0.40-0.83	**0.004**	0.57	0.40-0.81	**0.002**
Mon	0.90	0.63-1.29	0.570	1.03	0.72-1.49	0.860
Rakhine	0.39	0.26-0.58	**<0.001**	0.63	0.43-0.93	**0.022**
Yangon	1.07	0.77-1.49	0.681	1.07	0.75-1.52	0.713
Shan	0.78	0.51-1.17	0.222	0.86	0.59-1.24	0.418
Ayeyarwaddy	0.71	0.49-1.03	0.074	0.82	0.56-1.18	0.282
Naypyitaw	0.64	0.44-0.93	**0.020**	0.67	0.46-0.97	**0.035**

Highest Educational Status						
No Formal Education	Ref			Ref		
Primary	1.27	1.09-1.47	**<0.001**	1.24	1.04-1.47	**0.018**
Secondary	0.98	0.82-1.17	0.84	1.26	1.00-1.57	**0.047**
Higher	1.13	0.84-1.52	0.40	1.18	0.84-1.67	0.328
Currently employment						
No	Ref					
Yes	1.01	0.89-1.14	0.890			
Wealth index						
Poorest	Ref			Ref		
Poorer	1.49	1.28-1.73	**<0.001**	1.50	1.27-1.77	**<0.001**
Middle	1.87	1.59-2.20	**<0.001**	2.00	1.67-2.40	**<0.001**
Richer	2.05	1.72-2.45	**<0.001**	2.30	1.88-2.81	**<0.001**
Rich	2.59	2.01-3.35	**<0.001**	2.97	2.27-3.88	**<0.001**
Marital Status						
Single	Ref			Ref		
Married	3.35	2.93-3.83	**<0.001**	1.69	1.39-2.21	**<0.001**
Separated/ Divorced/ Widowed	1.92	1.53-2.42	**<0.001**	0.97	0.70-1.36	0.877
Parity						
0	Ref			Ref		
1	2.44	2.07-2.87	**<0.001**	1.47	1.12-1.93	**0.005**
2	3.37	2.83-4.03	**<0.001**	1.63	1.22-2.18	**0.001**
3	3.86	3.26-4.57	**<0.001**	1.71	1.29-2.28	**<0.001**
3+	2.92	2.48-3.43	**<0.001**	1.51	1.12-2.02	**0.006**

Number of Household Member						
≤5	Ref			Ref		
>5	0.74	0.66-0.83	**<0.001**	0.83	0.73-0.95	**0.005**
Frequency of watching TV						
Not at all	Ref			Ref		
Less than once a week	1.11	0.93-1.32	0.242	0.98	0.82-1.17	0.829
At least once a week	1.26	1.10-1.44	**0.001**	1.16	1.01-1.34	**0.040**

MDHS: Myanmar Demographic and Health Survey

CI: Confidence Interval

[1] *Variable with p-value less than <0.2 from unadjusted model were included into multivariable analysis*

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Frequency of Television viewing and association with overweight and obesity among women of the reproductive age group in Myanmar: Results from a nationwide cross-sectional survey

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ABSTRACT

Objectives: This study aimed to discern the association between the frequency of television viewing and overweight and obesity among reproductive age women of Myanmar.

Design: This was a cross-sectional study.

Setting: This study used Myanmar Demographic and Health Survey (2015-16) data.

Participants: Total of 12,021 women both aged 15-49 years and also not pregnant or did not deliver a child within the two months prior to the survey were included.

Primary and secondary outcome measures: The primary outcome was overweight (23.0 to <27.5 kg/m^2) and obesity (≥27.5 kg/m^2), which was measured using the Asian BMI cut off. Ordered logistic regression analysis was conducted to find the association between the explanatory and outcome variables. The potential confounders controlled in the multivariable analyses were age, place of residence, region of residence, highest educational status, current employment status, wealth index, parity and number of household members.

Results: The prevalence of overweight was 26.5% and obesity was 12.2% among the study participants. The odds of being overweight and obesewere 20% higher (adjusted odds ratio (AOR): 1.16, 95% CI: 1.02-1.32; *p*-value = 0.023) among those who watched television at least once a week compared to those who did not watch television at all. Rural women who watched television at least once a week were 1.2 times more likely to be obese (AOR: 1.16, 95% CI: 1.01-1.34; *p*-value = 0.040) compared to those who did not watch television at all.

Conclusions: Frequent television watching was associated with obesity among rural women of reproductive age in Myanmar.

Key words: Obesity, Overweight, Non-communicable Disease, Myanmar

STRENGTHS AND LIMITATIONS OF THE STUDY

- This study utilized a nationally representative sample to investigate the association between the frequency of television viewing and overweight/obesity among women of reproductive age from Myanmar.
- Due to utilization of standard and valid tools for data collection, the probability of the existence of measurement error is lower in this study in comparison to other cross-sectional studies conducted in Myanmar.
- Temporal relationship could not be established due to cross-sectional nature of the survey.
- The frequency of television viewing was measured in weeks, not in days/hours; the latter could have given more precise information.
- In the multivariable analysis, food habit and duration of physical activity were not included because that information was not collected in the survey.

INTRODUCTION

Both developed and developing countries are facing the increasing burden of overweight and obesity, which are posing as major public health problems.[1-3] The prevalence of overweight and obesity increased by 27.5% among the global adult population and 47.1% among the global child population between 1980 and 2013.[4] During the same time period, globally, the prevalence of overweight and obesity rose from 29.8% to 38.0% among adult females, in particular.[4] Although this burden is lowest in South and Southeast Asia, countries of this region are still experiencing the rising burden of overweight and obesity.[5] Myanmar is a low and middle-income country (LMIC) situated in the Southeast Asia region. In 2015-16, the first Myanmar Demographic and Health Survey (MDHS) was conducted using a nationally representative sample across the country.[6] The survey found a high prevalence of overweight and obesity among women of reproductive age.[7]

Overweight and obesity is an important risk factor for the development of several non-communicable diseases (NCDs) like diabetes mellitus [8], hypertension[9], cardiovascular diseases [10], cancer[11] and chronic kidney diseases .[12] In addition, overweight and obese women experience complications during pregnancy (gestational diabetes mellitus, pre-eclampsia and eclampsia) more frequently than women of normal body weight.[13 14]

It has been found that energy expenditure is very low among people who spend their leisure time watching television, rather than being involved in physical activities like playing games, gardening, etc. This ultimately increases their risk of gaining excessive body weight.[15 16] Television watching is also associated with an increase in energy intake, which may sometimes

be attributable to their frequent exposure to television advertisements of foods and beverages and the subsequent consumption of said foods and beverages.[17-21]

Across the world, many studies have shown a positive association between the increased frequency of television viewing and overweight/obesity. In the USA and Australia, it has been found that people who view television more frequently are at higher risk of being overweight/obese.[20 22-24] A study from Bangladesh has found that watching television frequently (at least once a week) was associated with obesity among women of reproductive age.[25] However, this association has not been explored in other South and Southeast Asian countries including Myanmar. Therefore, this study was conducted to determine the association between television viewing and the prevalence of overweight and obesity among women of reproductive age in Myanmar using the MDHS 2015-16 data.

METHODS

study settings

According to the 2014 census, the total population of Myanmar was 51.5 million with a population density of 76 persons per square kilometer (km^2). The country is home to 135 ethnic groups.[26 27] The *Gross Domestic Product* (*GDP*) growth rate of Myanmar was 6.4% and per capita, Gross National Income (GNI) was 1,455 USD in 2016-17. More than a quarter (26.1%) of the population was living under the poverty line in 2014. Myanmar also has the lowest life expectancy at birth (66.6 years) among the Association of Southeast Asian Nations (ASEAN). [26 28]

study design

This study analyzed the data of MDHS 2015-16, the first Demographic and Health Survey of Myanmar.[6] The detailed method has been published previously.[6] MDHS 2015-16 was a cross-sectional survey which used a nationally representative sample and was conducted through a joint collaboration between the Ministry of Health and Sports of Myanmar and ICF International. The United States Agency for International Development (USAID) and Three Millennium Development Goal Fund (3MDG) provided financial support for the survey. Two-stage cluster sampling techniques were used for sample selection. The sample was stratified for each of the seven states and eight regions of Myanmar. At the first stage, 442 clusters (urban: 123 and rural: 319) were selected randomly from a sample frame of 4,000 clusters. At the second stage, 30 households were selected from each of the clusters. In total, 13,260 households were selected for the final sample. The target group of this study was women of reproductive age (15-49 years). The permanent residents and the visitors who stayed in the selected households the night before the date of data collection were included in the questionnaire survey. Around 96% of eligible women agreed to participate in the survey. Among them, 98% agreed for anthropometric measurement. However, pregnant women and women who had given birth within the preceding two months of the survey were excluded. The final weighted sample size of this study was 12,021 (Figure 1**).**

survey tools and data collection

A standard woman's questionnaire used by the DHS program was adopted and modified according to the local context and pre-tested to collect the socio-demographic information (e.g. age, sex, household wealth index and place of residence) through face-to-face interviews.

Trained field staff carried out the interviews and anthropometric measurements. Measuring boards specially made by Shorr Productions were used for height measurement and lightweight SECA scales with digital screens were used for measuring the weight of the respondents.

The main outcome variables of this study were overweight and obesity. To define these variables, an Asia specific body mass index (BMI) cut-off value was used.[29] Women having a BMI <23.0 kg/m^2 were considered to be normal weight or underweight, women having a BMI between 23.0 kg/m^2 and <27.5 kg/m^2 were considered to be overweight and women having a BMI ≥27.5 kg/m^2 were considered to be obese.

The main explanatory variable of interest for this study was the frequency of viewing television. Data were collected as the following categories: (1) not viewing television at all, (2) viewing television less than once a week, and (3) viewing television at least once a week.[10] The other independent variables considered based on the literature review were age group, place of residence, region of residence, education, wealth quintile, current working status, parity and number of household members in the family. The categories of the variables are mentioned in Table 1.

Table 1: List of variables considered for the study

Name of the Variables	Categories
Outcome Variables:	
Body Mass Index (BMI)	a) 0= Normal weight or underweight (BMI <23 kg/m^2) b) 1= Overweight (BMI 23.0 kg/m^2 to <27.5 kg/m^2) c) 2= Obesity (BMI ≥27.5 kg/m^2)

Explanatory Variable:	
Frequency of Viewing Television	a) 0= Not at all b) 1= Less than once a week c) 2= At least once a week
Covariates:	
1. Age Groups	a) 0= 15-24 years b) 1= 25-34 years c) 2= 35-49 years
2. Place of Residence	a) 0= Urban b) 1= Rural
3. Region of Residence	a) 0= Kachin b) 1= Kayah c) 2= Kayin d) 3= Chin e) 4= Sagaing f) 5= Taninthayi g) 6= Bago h) 7= Magway i) 8= Mandalay j) 9= Mon k) 10= Rakhine l) 11= Yangon

	m) 12= Shan n) 13= Ayeyarwaddy o) 14= Naypyitaw
4. Education	a) 0= No education b) 1= Primary education c) 2= Secondary education d) 3= Higher education
5. Wealth quintile	a) 0= Poorest b) 1= Poorer c) 2= Middle d) 3= Richer e) 4= Richest
6. Current working status	a) 0= Yes b) 1= No
7. Parity	a) 0= 0 (nullipara) b) 1= 1 (primipara) c) 2= 2 d) 3= 3 e) 4= >3
8. Number of Household Members	a) 0= ≤5 b) 1= >5

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data analysis

Weighted descriptive statistics (frequency and percentage) were used to present the socio-demographic characteristics of the respondents. A chi-square (χ^2) test was performed to determine whether the groups differed in terms of the explanatory variables according to the BMI status. To find the association between the explanatory and outcome variables, ordered logistic regression analysis was conducted considering the proportional odds assumption was fulfilled. Initially, bivariate analyses were done. Variables which showed a *p-value* <0.20 in bivariate analyses were included in the multivariable model. This value of 0.2 was considered significant to prevent residual confounding in multivariable analysis.[30] The variables which showed *p*-value <0.05 in multivariable analysis were considered to be statistically significant. Both the unadjusted Crude Odd Ratio (COR) and Adjusted Odds Ratio (AOR) were reported. Variance inflation factors (VIF) were assessed to check multicollinearity among the variables. A VIF value greater than 5 was considered as an indication of multicollinearity; however, no significant multicollinearity was observed.[31] A test for interaction effect between the frequency of TV viewing and the place of residence was performed; however, no significant interaction effect was observed. The cluster effect was adjusted during analysis. All the analyses was done using Stata 13.0. The authors followed the guidelines outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (*STROBE*) statement in writing the manuscript (Supplementary File 1).

ethical consideration

MDHS received ethical approval from the Ethics Review Committee on Medical Research including Human Subjects in the Department of Medical Research, Ministry of Health

and Sports as well as from the ICF Institutional Review Board. Written informed consent was taken from the participants. In case of minor participants, assent form was signed by the respondents and written informed consent was given by the adult guardian.

patient Involvement

Patients were not involved in the study.

FINDINGS

socio-demographic characteristics of the respondents

The data of 12,021 weighted samples were analyzed. More than a quarter (26.5%) of the study participants were overweight, and 12.2% of them were obese (Figure 2). The socio-demographic characteristics of the respondents along with the prevalence of the three categories of BMI across the independent variables with the associated chi-square ($\chi 2$) value are presented in Table 2. The majority of the study participants was aged between 35 and 49 years (42.3%) and was residing in the rural area (70.8%). The highest proportion of participants was from the Yangon Region (15.1%), followed by the Ayeyarwaddy Region (12.5%) and the Mandalay Region (12.2%), whereas the lowest participation was from the Kayah Region (0.5%). Around half of the respondents (41.3%) were educated up to the primary level and about one-third (36.1%) received secondary level education; furthermore, 10.2% received higher education and 12.4% received no education. More than two-thirds (68.1%) of the women were employed at the time of interview. Nearly two-fifths of the women (41.7%) were nulliparous, while cumulatively a similar proportion of respondents (46.6%) had the experience of being pregnant- once (15.3%),

twice (15.8%), thrice (11.7%) and more than three times (15.5%). The highest proportion of the respondents belonged to the richest wealth quintile (22.2%) followed by richer (21.1%) and middle (20.9%) quintile. Among the study participants, the majority (60.1%) reported that they watched television at least once a week; however, 23.1% did not watch television at all and 16.8% watched television less than once a week. Except for current employment status, significant differences were found among the BMI of women across the explanatory variables. The prevalence of overweight and obesity increased with age (p-value <0.0001) and was the most common in the Yangon and Kachin Region (p-value <0.0001). This prevalence was also higher in the urban areas compared to the rural areas (overweight: 31.1% versus 24.6%; obesity: 17.9% versus 9.8%; p-value <0.0001). Plausibly, Women with higher educational status, having two children and belonging to the richest wealth group had a higher prevalence of overweight and obesity (p-value <0.0001). The prevalence of overweight and obesity was also higher among the individuals who used to watch television at least once a week (p-value <0.0001) (Table 2).

Table 2: Socio Demographic characteristics of the study participants and prevalence of overweight and obesity across the independent variables, MDHS 2015-16 (N= 12,021)

Variable	Frequency (%)	BMI Status (%)			$\chi 2$	*p*-value
		BMI <23	23≥ BMI <27.5	BMI ≥27.5		
Age Group (years)						
15-24	3433 (28.6)	82.4	14.3	3.3	173.9	**<0.0001**
25-34	3504 (29.1)	60.4	27.6	12.0		
35-49	5084 (42.3)	47.7	34.0	18.3		
Place of Residence						
Urban	3505 (29.2)	51.0	31.1	17.9	258.4	**<0.0001**
Rural	8516 (70.8)	65.6	24.6	9.8		
Region of Residence						
Kachin	334 (2.8)	54.6	30.0	15.4	240.1	**<0.0001**
Kayah	60 (0.5)	63.3	27.1	9.6		
Kayin	274 (2.3)	59.1	27.1	13.8		
Chin	90 (0.8)	71.7	23.9	4.4		
Sagaing	1351 (11.3)	58.7	27.7	13.6		
Taninthayi	265 (2.2)	57.0	28.6	14.4		
Bago	1197 (9.9)	64.5	25.9	9.6		
Magway	1030 (8.6)	67.7	24.0	8.3		
Mandalay	1462 (12.2)	64.2	25.4	10.5		

Mon	432 (3.6)	59.7	25.0	15.3		
Rakhine	695 (5.8)	75.3	19.2	5.5		
Yangon	1822 (15.1)	49.7	33.8	16.5		
Shan	1216 (10.1)	60.2	25.7	14.1		
Ayeyarwaddy	1508 (12.5)	64.8	23.3	11.8		
Naypyitaw	285 (2.3)	63.3	26.0	10.7		
Highest Educational Status						
No Formal Education	1485 (12.4)	65.4	25.3	9.3	40.5	**0.0003**
Primary	4966 (41.3)	59.8	27.6	12.6		
Secondary	4345 (36.1)	63.1	25.3	11.6		
Higher	1225 (10.2)	56.6	28.1	15.3		
Currently Employed						
Yes	8184 (68.1)	61.2	26.6	12.2	0.2	0.9348
No	3837 (32.9)	61.6	26.4	12.0		
Wealth index						
Poorest	2052 (17.1)	75.2	18.6	6.2	427.7	**<0.0001**
Poorer	2252 (18.7)	66.8	25.0	8.2		
Middle	2509 (20.9)	61.5	28.0	10.5		
Richer	2533 (21.1)	57.2	28.2	14.6		
Richest	2675 (22.2)	49.9	30.9	19.2		
Marital Status						
Single	4191 (34.9)	76.8	17.4	5.8	120.1	**<0.0001**
Currently Married	7021 (58.4)	52.1	31.9	16.0		
Separated/Divorced/Widowed	809 (6.7)	61.1	27.4	11.5		
Parity						
0	5010 (41.7)	75.2	18.4	6.4	759.6	**<0.0001**
1	1844 (15.3)	55.5	30.8	13.7		

2	1903 (15.8)	49.4	32.7	17.9		
3	1405 (11.7)	45.6	36.1	18.3		
>3	1859 (15.5)	54.0	30.4	15.6		
Number of Household Member						
≤5	7402 (61.6)	59.8	27.2	13.0	7.4	**<0.001**
>5	4620 (38.4)	63.9	25.5	10.6		
Frequency of Viewing Television						
Not at all	2779 (23.1)	67.2	24.5	8.3	89.7	**<0.001**
Less than once a week	2015 (16.8)	63.3	25.9	10.8		
At least once a week	7227 (60.1)	58.5	27.5	14.0		

The frequency of watching television at least once a week was higher among the urban women than the rural women (80.8% versus 51.7%). Around 30% of the rural women did not view television at all, whereas the proportion was lower for the urban women (7.2%) (Figure 3).

association between the frequency of viewing television and overweight and obesity

Ordered logistic regression was used to discern the association between the frequency of viewing television and overweight and obesity. During the analyses, the normal weight category (BMI < 23 kg/m^2) was held as the reference group. The results are presented in Table 3. In the final model after adjusting for age, place and region of residence, wealth index, highest educational status, current employment status, parity and number of household members, it was found that, women who watched television at least once a week were 1.2 times more likely to be overweight and obesethan the women who never watched television (AOR: 1.16, 95% CI: 1.02-1.32; *p*-value=0.023).

When stratified by urban and rural residence, overweight and obesity showed significant association with the frequency of viewing television in the urban areas. However, in the rural areas, women who watched television at least once a week were 1.2 times more likely to be overweight and obese than those who did not watch television at all (AOR: 1.16, 95% CI: 1.01-1.34; *p*-value=0.040) (Table 3).

The final logistic regression models are shown in supplementary table 1-3 (supplementary file 2).

Table 3: Association between the frequency of viewing Television and overweight and obesity among reproductive age women of Myanmar, MDHS* 2015-16

Frequency of viewing Television				
	COR**(95% CI***)	*p*-value	AOR****(95% CI***)	*p*-value
Total:				
Not at all	Ref		Ref	
Less than once a week	1.20 (1.03-1.40)	**0.020**	1.01 (0.87-1.19)	0.870
At least once a week	1.49 (1.32-1.69)	**<0.001**	1.16 (1.02- 1.32)	**0.023**
In Urban Area:				
Not at all	Ref		Ref	
Less than once a week	1.15 (0.80-1.67)	0.441	1.05 (0.73-1.51)	0.779
At least once a week	1.25 (0.93-1.69)	0.144	1.14(0.85-1.52)	0.389
In Rural Area:				
Not at all	Ref		Ref	
Less than once a week	1.11 (0.93-1.32)	0.242	0.98 (0.82-1.17)	0.829
At least once a week	1.26 (1.10-1.44)	**0.001**	1.16 (1.01-1.34)	**0.040**

* *MDHS: Myanmar Demographic and Health Survey*

** *COR: Crude Odds Ratio*

*** *CI: Confidence Interval*

***** AOR: Adjusted Odds Ratio*

Results are based on ordered logistics regression and adjusted for age, place of residence, region of residence, highest educational status, current employment status, wealth index, parity and number of household members. BMI <23 group was held as the reference group.

model goodness-of-fit: To assess the internal validity of the regression model, the F-adjusted mean residual goodness-of-fit test was used. The *p*-value of the F statistics of the adjusted model was <0.001, indicating an acceptable model fitness.

DISCUSSION

To the best of our knowledge, this is the first study to utilize a nationally representative sample to examine the association between frequency of television viewing with the prevalence of overweight and obesity among women of reproductive age in Myanmar. More than one fourth of the women surveyed were overweight and one in eight women was obese. This study also found that watching television at least once a week was significantly associated with overweight/obesity in women of reproductive age in rural Myanmar.

The prevalence of overweight and obesity among women of reproductive age was found to be 26.5% and 12.2% respectively. The total burden of overweight/obesity (38.7%) was almost similar to the burden of overweight and obesity among the same target group in other South and Southeast Asian countries, including Nepal (32.8%)[32], Bangladesh (36%)[3] and Pakistan (39%).[33] Each of these studies utilized a nationally representative sample and the Asian BMI cutoff.

The prevalence of overweight and obesity was higher among the women living in the urban areas compared to those living in the rural areas. This finding is consistent with studies done in other South and Southeast Asian countries, including Bangladesh, as well as in the other continents.[3 25 34-36] Urban women had a higher frequency of television watching. This may be due to the higher coverage of electricity and the availability of many satellite channels in urban areas in comparison to rural areas.[25]

It was found that among rural women, the prevalence of overweight and obesity was significantly associated with watching television at least once a week. This finding is also consistent with the finding from Bangladesh.[25]

Despite the frequency of television watching among urban women, there was no association between this behavior and the prevalence of overweight and obesity. However, they were more likely to be overweight/obese than rural women. A propensity towards a more sedentary lifestyle and the intake of high-calorie foods by the urban residents may be potential determinants that have overridden the effect from an increased frequency of watching television. On the other hand, reliance on less developed transportation facilities, involvement in more laborious work and comparatively lower consumption of obesogenic diets among the rural women are factors that may contribute to a lower prevalence of overweight and obesity.[25] Those who view television more frequently in the rural area are more prone to lead a sedentary lifestyle and as such are at greater risk of developing obesity.[25]

The findings from our study are coherent with a recent study in Bangladesh, which showed a positive association between the frequency of television viewing and overweight and obesity in women of reproductive age.[25] Similar positive associations were also found in developed countries (e.g. USA and Australia).[20 22-24] In a recently published multi-country study, this association has also been observed in the case of children and adolescents.[37]

Policy and Program Implications

The high prevalence of overweight/obesity is associated with an increased burden from NCDs in Myanmar, as shown in recent evidence.[7 38] An unintended consequence of the continuing economic development of the country is the increasing preference for a sedentary lifestyle and obesogenic food, which, in turn, is raising the burden of overweight/obesity. Considering the epidemiologic, demographic, and nutritional transition, the policymakers of Myanmar should focus on the prevention and control of both overweight and obesity and NCDs.

The newly released 'Myanmar National Health Plan 2017-2021' incorporates NCD prevention and control programs.[39] Furthermore, a Social Behavioral Change Communication (SBCC) campaign should be developed in order to promote physical activity and raise awareness among the population, especially among children and adolescents, in order to prevent overweight/obesity as early as possible. Further research should be conducted among men and adolescents to determine whether this positive association exists among those target population as well.

STRENGTHS AND LIMITATIONS

This is the first study, which utilized a nationally representative sample to examine the association between the frequency of watching television and overweight/obesity among women of reproductive age in Myanmar. Moreover, as MDHS utilized standard and valid tools for data collection, the probability of the existence of any measurement error is lower in this study in comparison to other cross-sectional studies conducted in Myanmar. However, the survey could not establish the temporal relationship between the exposure and the outcome variables because of its cross-sectional design. As a result, the causal association that frequent TV watching may cause obesity could not be established. The frequency of television viewing was measured in weeks, as opposed to days/hours; the latter could have given more precise information. In the multivariable analysis, food habit and duration of physical activity were not included because this information was not collected in MDHS. There may be the presence of reporting bias while measuring the frequency of television watching. The information related to the frequency of time

spent on other types of telecommunication devices such as mobile phones or computers was not collected, so the association with those variables with overweight/obesity could not be measured.

CONCLUSIONS

The rising burden of overweight and obesity is now a global concern. Obesity ultimately leads towards the development of NCDs and premature death. The results from this study demonstrate that watching television is associated with obesity among reproductive age women in Myanmar. Therefore, necessary steps should be taken to improve awareness regarding the harmful consequences of watching TV for longer hours and physical inactivity as well as to encouragement of increased physical activity. Additional research is also warranted to explore the situation among the general population of Myanmar.

LIST OF ABBREVIATION

ASEAN- Association of Southeast Asian Nations

BMI- Body Mass Index

GDP- *Gross Domestic Product*

GNI- Gross National Income

NCDs- Non-Communicable Diseases

MDHS- Myanmar Demographic and Health Survey

SBCC- Social Behavioral Change Communication

SEARO- South-East Asia Regional Office

USAID- United States Agency for International Development

USD- United States Dollar

WHO- World Health Organization

3MDG- Three Millennium Development Goal Fund

Contributors

RDG, IHS, MH, IS and MS conceptualized the study. RDG, IHS, MH, IS, MRH and MS designed the study and acquired the data. RDG, IHS, MH and IS conducted the data analysis. RDG, IHS, MH, IS, MRH and MS interpreted the data. RDG, IHS, MH, IS and MRH prepared the first draft. RDG, IHS, MH, IS, MRH and MS participated in critical revision of the manuscript and contributed to its intellectual improvement. All authors went through the final draft and approved it for submission. RDG, IHS, MH and IS equally contributed in this work as first author.

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Competing Interests

None declared.

Patient Consent

None Declared

Disclaimer

The authors are alone responsible for the integrity and accuracy of data analysis and the writing the manuscript.

Ethics Approval

The datasets were obtained from DHS Programme with proper procedure. The study exempt from collecting ethical approval because the survey protocols were reviewed and approved by Ethics Review Committee on Medical Research including Human Subjects in the Department of Medical Research, Ministry of Health and Sports as well as from the ICF Institutional Review Board.

Data Sharing Statement

The dataset of MDHS 2015-16 is available at the Demographic and Health Surveys Program. Extra data is available which is available on request at http://dhsprogram-com/what-we-do/survey/survey-display-349.cfm

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Figures:

Figure 1: Flowchart showing the process of selecting the participants in the survey

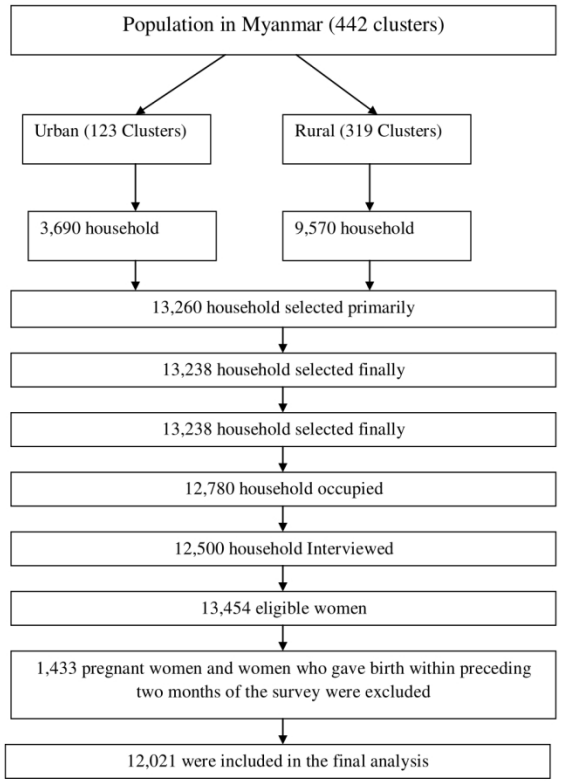
Figure 2: Distribution of the respondents by BMI status

Figure 3: Distribution of the respondents by place of residence with frequency of watching television

Supplementary Materials:

Supplementary File 1: STROBE Checklist

Supplementary File 2: Supplementary Tables



Flowchart showing the process of selecting the participants in the survey

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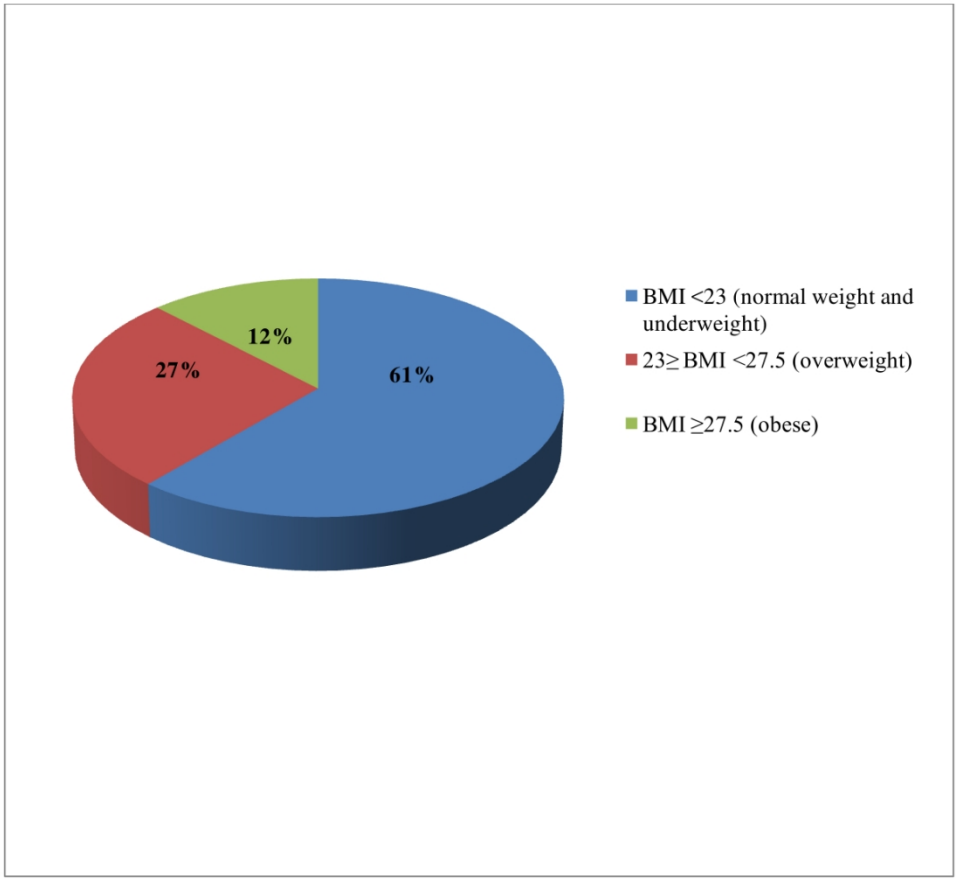
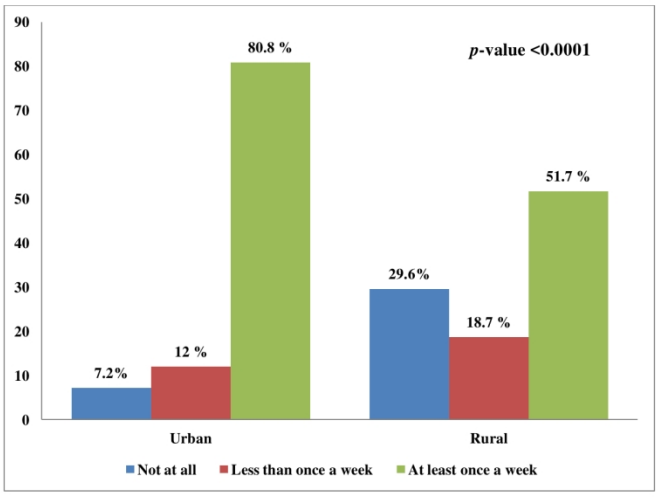


Distribution of the respondents by BMI status

107x101mm (300 x 300 DPI)



Distribution of the respondents by place of residence with frequency of watching television

143x186mm (300 x 300 DPI)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Title of the study: **Frequency of Television viewing and association with overweight and obesity among women of the reproductive age group in Myanmar: Results from a nationwide cross-sectional survey**

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7-8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-10
Bias	9	Describe any efforts to address potential sources of bias	11
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	11
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	11
		(*b*) Describe any methods used to examine subgroups and interactions	11

		(*c*) Explain how missing data were addressed	11
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	7
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	12-13
		(b) Indicate number of participants with missing data for each variable of interest	7
Outcome data	15*	Report numbers of outcome events or summary measures	12-19
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	17-19
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	20
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	22
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20-22
Generalisability	21	Discuss the generalisability (external validity) of the study results	22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	24

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Supplementary Tables

Supplementary Table 1: Crude and Adjusted odds ratios for factors associated with overweight and obesity compared to normal weight among women of Myanmar, MDHS 2015-16.

Variable	Crude Odds Ratio (COR)	95% CI	*p*-value[1]	Adjusted Odds Ratio (AOR)	95% CI	*p*-value[1]
Age Group (in years)						
15-24	Ref			Ref		
25-34	3.11	2.73-3.54	**<0.001**	2.34	2.01-2.73	**<0.001**
35-49	5.21	4.66 - 5.83	**<0.001**	3.65	3.14-4.26	**<0.001**
Place of Residence						
Urban	Ref			Ref		
Rural	0 .54	0.47-0.61	**<0.001**	0.74	0.64-0.87	**<0.001**
Region of Residence						
Kachin	Ref			Ref		
Kayah	0.68	0.49-0.94	**0.019**	0.68	0.50-0.92	**0.012**
Kayin	0.84	0.64-1.10	0.202	0.88	0.69-1.12	0.301
Chin	0.45	0.33-0.61	**<0.001**	0.50	0.38-0.66	**<0.001**

Sagaing	0.85	0.65-1.11	0.234	0.88	0.67-1.15	0.343
Taninthayi	0.91	0.70-1.17	0.459	1.03	0.78-1.36	0.832
Bago	0.65	0.51-0.82	**<0.001**	0.68	0.54-0.87	**0.002**
Magway	0.56	0.43-0.74	**<0.001**	0.60	0.45-0.77	**<0.001**
Mandalay	0.67	0.52-0.87	0.002	0.64	0.50-0.82	**<0.001**
Mon	0.84	0.64-1.11	0.217	0.87	0.67-1.20	0.381
Rakhine	0.39	0.29-0.52	**<0.001**	0.61	0.45-0.82	**0.001**
Yangon	1.18	0.90-1.55	0.224	0.98	0.75-1.27	0.854
Shan	0.81	0.60-1.09	0.165	0.91	0.68-1.20	0.486
Ayeyarwaddy	0.66	0.50-0.88	0.005	0.81	0.61-1.08	0.152
Naypyitaw	0.69	0.53-0.90	0.006	0.68	0.52-0.90	**0.008**
Highest Educational Status						
No Formal Education	Ref			Ref		
Primary	1.29	1.13-1.48	**<0.001**	1.24	1.06-1.45	**0.006**
Secondary	1.13	0.97-1.32	0.115	1.26	1.04-1.53	**0.018**
Higher	1.50	1.22-1.83	**<0.001**	1.10	0.86-1.40	0.452
Currently employment						
No	Ref					

Yes	1.02	0.91-1.13	0.762			
Wealth index						
Poorest	Ref			Ref		
Poorer	1.49	1.29-1.72	**<0.001**	1.46	1.27-1.72	**<0.001**
Middle	1.87	1.61-2.18	**<0.001**	1.92	1.62-2.28	**<0.001**
Richer	2.31	1.97-2.72	**<0.001**	2.26	1.83-2.72	**<0.001**
Rich	3.16	2.68-3.72	**<0.001**	2.82	2.28-3.48	**<0.001**
Marital Status						
Single	Ref			Ref		
Married	3.03	2.73-3.37	**<0.001**	1.60	1.30-1.98	**<0.001**
Separated/ Divorced/ Widowed	2.10	1.75-2.51	**<0.001**	1.03	0.80-1.32	0.820
Parity						
0	Ref			Ref		
1	2.42	2.13-2.75	**<0.001**	1.44	1.15-1.81	**0.002**
2	3.13	2.73-3.59	**<0.001**	1.50	1.19-1.88	**0.001**
3	3.53	3.07-4.06	**<0.001**	1.61	1.29-2.02	**<0.001**

3+	2.62	2.30-2.99	**<0.001**	1.42	1.13-1.79	**0.003**
Number of Household Member						
≤5	Ref			Ref		
>5	0.83	0.76-0.92	**<0.001**	0.92	0.83-1.03	0.150
Frequency of watching TV						
Not at all	Ref			Ref		
Less than once a week	1.20	1.03-1.40	**0.020**	1.01	0.87-1.19	0.870
At least once a week	1.49	1.32-1.69	**<0.001**	1.16	1.02-1.32	**0.023**

MDHS: Myanmar Demographic and Health Survey

CI: Confidence Interval

[1] *Variable with p-value less than <0.2 from unadjusted model were included into multivariable analysis*

Supplementary Table 2: Crude odds ratios for factors associated with overweight and obesity compared to normal weight for urban area among women of Myanmar, MDHS 2015-16.

Variable	Crude Odds Ratio (COR)	95% CI	*p*-value[1]	Adjusted Odds Ratio (AOR)	95% CI	*p*-value[1]
Age Group (in years)						
15-24	Ref			Ref		
25-34	3.43	2.72-4.33	**<0.001**	2.67	2.07-3.44	**<0.001**
35-49	7.63	6.32-9.21	**<0.001**	5.52	4.30-7.08	**<0.001**
Region of Residence						
Kachin	Ref			Ref		
Kayah	0.70	0.42-1.19	0.188	0.63	0.38-1.05	0.075
Kayin	0.95	0.75-1.19	0.646	0.94	0.69-1.28	0.675
Chin	0.76	0.56-1.02	0.070	0.71	0.51-0.99	**0.041**
Sagaing	0.96	0.72-1.28	0.790	0.99	0.70-1.40	0.943
Taninthayi	0.62	0.47-0.82	**0.001**	0.61	0.38-0.98	**0.042**
Bago	0.71	0.53-0.93	**0.015**	0.62	0.43-0.89	**0.010**
Magway	0.59	0.36-0.97	**0.038**	0.50	0.29-0.86	**0.013**
Mandalay	0.98	0.79-1.22	0.848	0.85	0.62-1.18	0.334

Mon	0.77	0.49-1.20	0.243	0.62	0.32-1.20	0.154
Rakhine	0.61	0.41-0.89	**0.012**	0.60	0.43-0.83	**0.002**
Yangon	1.00	0.76-1.34	0.975	1.01	0.71-1.46	0.944
Shan	1.03	0.69-1.55	0.885	1.05	0.65-1.68	0.839
Ayeyarwaddy	0.74	0.52-1.06	0.099	0.89	0.55-1.44	0.632
Naypyitaw	0.80	0.51-1.25	0.322	0.75	0.49-1.15	0.181
Highest Educational Status						
No Formal Education	Ref			Ref		
Primary	1.14	0.84-1.56	0.389	1.10	0.76-1.58	0.605
Secondary	0.78	0.57-1.06	0.107	1.13	0.76-1.68	0.530
Higher	0.84	0.59-1.20	0.346	0.92	0.61-1.40	0.704
Currently employment						
No	Ref			Ref		
Yes	1.22	1.00-1.49	**0.046**	1.29	1.06-1.56	**0.010**
Wealth index						
Poorest	Ref			Ref		
Poorer	1.35	0.76-2.37	0.302	1.44	0.69-2.99	0.330

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Middle	1.53	0.94-2.50	0.089	1.99	1.09-3.64	**0.025**
Richer	2.14	1.28-3.57	**0.004**	2.65	1.43-4.91	**0.002**
Rich	2.43	1.47-4.02	**0.001**	3.08	1.63-5.82	**0.001**
Marital Status						
Single	Ref			Ref		
Married	3.21	2.73-3.78	**<0.001**	1.46	1.01-2.11	**0.042**
Separated/ Divorced/ Widowed	2.67	2.01-3.55	**<0.001**	1.05	0.70-1.58	0.828
Parity						
0	Ref			Ref		
1	2.61	2.05-3.33	**<0.001**	1.36	0.89-2.08	0.152
2	3.21	2.60-3.96	**<0.001**	1.27	0.87-1.85	0.221
3	3.95	3.01-5.20	**<0.001**	1.50	1.03-2.18	**0.034**
3+	3.91	2.96-5.17	**<0.001**	1.44	0.97-2.14	0.072
Number of Household Member						
≤5	Ref			Ref		
>5	0.94	0.79-1.11	0.449	1.13	0.92-1.38	0.250

Frequency of watching TV*						
Not at all	Ref			Ref		
Less than once a week	1.15	0.80-1.67	0.441	1.05	0.73-1.52	0.779
At least once a week	1.25	0.93-1.69	0.144	1.14	0.85-1.52	0.389

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[1] *Variable with p-value less than <0.2 from unadjusted model were included into multivariable analysis*

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Supplementary Table 3: Adjusted odds ratios for factors associated with overweight and obesity compared to normal weight for rural area among women of Myanmar, MDHS 2015-16.

Variable	Crude Odds Ratio (COR)	95% CI	*p*-value[1]	Adjusted Odds Ratio (AOR)	95% CI	*p*-value[1]
Age Group (in years)						
15-24	Ref			Ref		
25-34	3.10	2.65-3.62	**<0.001**	2.09	1.75-2.51	**<0.001**
35-49	4.61	4.01-5.30	**<0.001**	2.89	2.38-3.49	**<0.001**
Region of Residence						
Kachin	Ref			Ref		
Kayah	0.70	0.46-1.06	0.091	0.71	0.48-1.06	0.091
Kayin	0.85	0.58-1.24	0.401	0.89	0.63-1.25	0.497
Chin	0.36	0.23-0.57	**<0.001**	0.43	0.28-0.64	**<0.001**
Sagaing	0.90	0.63-1.30	0.586	0.88	0.61-1.25	0.466
Taninthayi	1.10	0.77-1.56	0.606	1.25	0.88-1.78	0.206
Bago	0.68	0.49-0.94	**0.018**	0.72	0.52-0.99	**0.044**
Magway	0.62	0.44-0.87	**0.006**	0.62	0.44-0.86	**0.005**
Mandalay	0.58	0.40-0.83	**0.004**	0.57	0.40-0.81	**0.002**
Mon	0.90	0.63-1.29	0.570	1.03	0.72-1.49	0.860
Rakhine	0.39	0.26-0.58	**<0.001**	0.63	0.43-0.93	**0.022**
Yangon	1.07	0.77-1.49	0.681	1.07	0.75-1.52	0.713
Shan	0.78	0.51-1.17	0.222	0.86	0.59-1.24	0.418
Ayeyarwaddy	0.71	0.49-1.03	0.074	0.82	0.56-1.18	0.282
Naypyitaw	0.64	0.44-0.93	**0.020**	0.67	0.46-0.97	**0.035**

Highest Educational Status						
No Formal Education	Ref			Ref		
Primary	1.27	1.09-1.47	**<0.001**	1.24	1.04-1.47	**0.018**
Secondary	0.98	0.82-1.17	0.84	1.26	1.00-1.57	**0.047**
Higher	1.13	0.84-1.52	0.40	1.18	0.84-1.67	0.328
Currently employment						
No	Ref					
Yes	1.01	0.89-1.14	0.890			
Wealth index						
Poorest	Ref			Ref		
Poorer	1.49	1.28-1.73	**<0.001**	1.50	1.27-1.77	**<0.001**
Middle	1.87	1.59-2.20	**<0.001**	2.00	1.67-2.40	**<0.001**
Richer	2.05	1.72-2.45	**<0.001**	2.30	1.88-2.81	**<0.001**
Rich	2.59	2.01-3.35	**<0.001**	2.97	2.27-3.88	**<0.001**
Marital Status						
Single	Ref			Ref		
Married	3.35	2.93-3.83	**<0.001**	1.69	1.39-2.21	**<0.001**
Separated/ Divorced/ Widowed	1.92	1.53-2.42	**<0.001**	0.97	0.70-1.36	0.877
Parity						
0	Ref			Ref		
1	2.44	2.07-2.87	**<0.001**	1.47	1.12-1.93	**0.005**
2	3.37	2.83-4.03	**<0.001**	1.63	1.22-2.18	**0.001**
3	3.86	3.26-4.57	**<0.001**	1.71	1.29-2.28	**<0.001**
3+	2.92	2.48-3.43	**<0.001**	1.51	1.12-2.02	**0.006**

Number of Household Member						
≤5	Ref			Ref		
>5	0.74	0.66-0.83	**<0.001**	0.83	0.73-0.95	**0.005**
Frequency of watching TV						
Not at all	Ref			Ref		
Less than once a week	1.11	0.93-1.32	0.242	0.98	0.82-1.17	0.829
At least once a week	1.26	1.10-1.44	**0.001**	1.16	1.01-1.34	**0.040**

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[1] *Variable with p-value less than <0.2 from unadjusted model were included into multivariable analysis*