

BMJ Open Association between television viewing and overweight and obesity among women of reproductive age in Timor-Leste: evidence from the demographic health survey 2016

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ABSTRACT

Objective This study aimed to assess the possible relationship between television viewing and overweight and obesity among Timorese women of reproductive age.

Methods This cross-sectional study analysed the Timor-Leste Demographic and Health Survey 2016 dataset. A weighted sample of 11 398 Timorese women aged 15–49 years was chosen using a two-stage stratified random sampling technique. Asian criteria-based body mass index (BMI) cut-offs were used to define overweight (BMI 23.0 to <27.5 kg/m²) and obesity (BMI ≥27.5 kg/m²). Frequency of TV viewing was categorised into three groups: (1) not at all, (2) less than once a week and (3) at least once a week. Multilevel ordered logistic regression was performed to identify the correlates of overweight and obesity. Both crude and adjusted odds ratios (AOR) along with a 95% CI were calculated to show the strength of association.

Results Among 11 398 respondents, 19.4% were overweight or obese (overweight: 15.7% and obese: 3.8%). Although about half of the respondents reportedly did not watch TV at all, just over two-thirds watched TV at least once a week. Women who watched TV at least once a week were found to have 1.3 times the odds of being overweight or obese compared with those who never watched TV (AOR: 1.3, 95% CI: 1.1 to 1.5; *p*<0.001). However, when stratified by settlement type, the statistical significance stood for the rural women only (AOR: 1.5, 95% CI: 1.2 to 1.8; *p*<0.001), after adjusting for the covariates.

Conclusion Watching TV at least once a week was found to be a significant correlate of overweight and obesity in rural Timorese women of reproductive age. Further studies need to be undertaken to assess physical activity, sedentary and dietary patterns to clarify the possible mechanism through which TV viewing may influence BMI in those groups.

INTRODUCTION

High body mass index (BMI) (ie, overweight and obesity) is considered the fourth leading risk factor of disability worldwide when ranked by disability-adjusted life-years.¹

Strengths and limitations of this study

- To the best of our knowledge, this study is the first to assess the relationship of TV viewing frequency with overweight and obesity in Timor-Leste.
- This study analysed a nationally representative survey dataset with a high response rate (97%), hence the findings are generalisable to a great extent.
- The survey utilised validated questionnaires, calibrated measurement tools and well-trained enumerators and technicians, limiting the chance of measurement error.
- A self-reported measurement of TV viewing frequency/duration may have led to a reporting bias.
- Some of the potentially important behavioural risk factors (eg, inactivity or sedentary status, poor dietary habit, tobacco and alcohol consumption) could not be adjusted for in the multivariable analyses to discern the strength of the independent relationship between TV viewing and overweight and obesity, as information regarding those risk factors was not collected in the survey.

Epidemiological studies throughout the years have found associations between overweight and obesity and many notable chronic diseases, such as hypertension, cardiovascular and cerebrovascular diseases, type 2 diabetes mellitus,^{2 3} chronic kidney disease, a number of cancers,⁴ a group of musculoskeletal disorders^{5 6} and some forms of respiratory diseases.⁷ In particular, obesity is suggestive of contributing to severe forms of infection amid the COVID-19 pandemic.⁸ Among the COVID-19-affected groups that needed critical care, a higher prevalence of obesity was observed.^{9 10} Additionally, a significant inverse correlation was found between age and BMI among the affected individuals, suggesting younger patients' being more likely to be obese.¹¹ Moreover, obesity may



also lead to psychosocial impairment¹² and a significant reduction in both health-related quality of life¹³ and overall life expectancy.¹⁴ Furthermore, it poses drastic economic implications as well, as highlighted by a systematic review in 2011, which showed obese people enduring 30% excess medical expenses, compared with their normal weight counterparts.¹⁵ This condition, though currently affecting over a third of the global population,¹⁶ is largely preventable.¹² Even a modest reduction of body weight was found to be associated with meaningful risk attenuation for hypertension, hyperglycaemia, dyslipidaemia and many other comorbidities.¹⁷ Of those who suffer the most, the women of reproductive age are of particular importance. Apart from the aforementioned complications, overweight and obesity pose an additional burden on women of reproductive age due to obstetric complications, such as gestational diabetes mellitus and pre-eclampsia, surgical and anaesthetic complications, as well as an increased chance of miscarriage; these obstetric risks are more common in low-resource settings, which have a substandard continuum of care to deal with the existing obstetric and gynaecological problems.^{18 19}

Globally, both developed and underdeveloped countries are experiencing an escalating prevalence of overweight and obesity.²⁰ Due to demographic and epidemiological transition, obesity and overweight, once considered an archetypal high-income country problem, are becoming dramatically prevalent even in the least developed countries. Timor-Leste (also known as East Timor), despite only gaining international recognition as a sovereign nation in 2002, has continued to struggle to achieve economic solvency amid the ongoing massive rebuilding²¹ and has remained one of the least developed countries in the world thus far.²² Although Timor-Leste has been experiencing a massive burden of undernourishment,²³ a looming double burden of malnutrition due to epidemiological transition cannot be ruled out. This might pose a tremendous challenge for the country's healthcare system, especially when the country is still far off course from meeting its nutrition targets; that is evident from the fact that more than 40% of Timorese women of reproductive age are anaemic.²³ On the contrary, almost 5% of the women of Timor-Leste are reportedly obese²³; however, the proportion of overweight and obesity among the women of reproductive age is not known. Therefore, it is important to know the prevalence and correlates of these conditions in this age group.

Spending time watching TV was found to be associated with excess body weight among both men and women in prospective studies.^{24 25} Some propositions that may elucidate this relationship are: (1) replacement of the daily recommended as well as discretionary physical activity time with TV watching time,²⁶ (2) sleep deprivation²⁷ and (3) promotion of unhealthy dietary choices²⁶ that contribute to weight gain. Women of reproductive age were found to be sedentary to an alarming extent in a large epidemiological study.²⁸ Moreover, sedentariness has been linked with idiopathic infertility of women in

a case-control study.²⁹ TV watching was found to be a correlate of overweight and obesity in Indonesia, a neighbouring country of Timor-Leste.³⁰ However, this relationship is yet to be studied in the context of Timor-Leste. This study, therefore, aimed to assess the relationship between TV viewing and overweight and obesity among Timorese women of reproductive age. Furthermore, previous studies stratified this relationship by type of settlement (urban/rural) and found a stronger association among the TV viewing groups in urban areas.^{19 31 32} This study, therefore, additionally tries to elucidate that hypothesis in the context of Timor-Leste.

METHODS

Study setting

Timor-Leste is a lower-middle-income country in Southeast Asia. The nation gained independence in 1999 after a long conflict with Indonesia.³³ In 2018, the total population was 1.2 million, with an annual growth rate of 2%.³⁴ Approximately, three-fourths of the population (74%) reside in rural areas.³⁵ Health indicators in this country are one of the poorest in Southeast Asia.³³ Timor-Leste has a three-tiered public health system. The primary healthcare system consists of health posts and community health centres, whereas the secondary and tertiary health systems consist of district hospitals and a national hospital, respectively.³⁶ Currently, there are eight doctors and nine nurses per 10 000 people in Timor-Leste.³⁷

Study design

This study analysed the Timor-Leste Demographic Health Survey (TLDHS) 2016 dataset.³⁸ The TLDHS was a nationally representative cross-sectional survey implemented between September and December of 2016 by the General Directorate of Statistics under the Ministry of Planning and Finance. The Ministry of Health also collaborated in the implementation of the survey. ICF, with the financial support of the United States Agency for International Development (USAID), provided technical support for the survey.³⁸ A stratified cluster random sampling technique was applied for the selection of households for data collection. The 2015 Timor-Leste Population and Housing Census acted as the sampling frame for the TLDHS. The sampling was done in two stages. Initially, 455 enumeration areas (EAs) (urban: 129 and rural: 326) were selected based on the probability proportional to EA size. At the second stage, a fixed number of households (n=26) were selected randomly from each of the selected EAs. In total, 11 829 households were selected. However, only 11 660 of those households were found to be occupied. The final data were collected from 11 502 households (urban: 3215 households and rural: 8287 households), which yielded a 99% response rate. Women aged 15–49 years, who were either permanent residents or resided in the households overnight before the survey, were interviewed. The response rate among the eligible women was 97%. The detailed methods including

sampling and data collection procedure of the TLDHS 2016 were published previously.³⁵

Data collection and measurements

Data were collected through a standard pretested women's questionnaire developed by the DHS programme. The questionnaire was modified according to the local context. It was developed in English, then translated into Tetum (local language of Timor-Leste). Trained interviewers collected the data via face-to-face interviews. Tablet computers were used for the questionnaire-based survey. Anthropometric measurements were conducted using calibrated measuring boards and calibrated Seca scales.³⁵

Study population, variables, and inclusion criteria

The target population of this study were Timorese women aged 15–49 years. Women who were either pregnant or gave birth in the 2 months prior to the survey were excluded. The primary study variables of interest for this study were high BMI (ie, overweight and obesity) and frequency of TV viewing. Asian criteria-based BMI cut-offs were used to categorise BMI in order to allocate a more accurate association between body fat percentage and BMI for the target population.³⁹ The following categories of BMI were used: (1) normal and/or underweight (BMI: <23.0 kg/m²), (2) overweight (BMI: 23.0 kg/m² to <27.5 kg/m²) and (3) obesity (BMI: ≥27.5 kg/m²). The frequency of TV watching was categorised into three groups: (1) not at all, (2) less than once a week and (3) at least once a week.³⁵ Based on the literature, the following covariates were considered: age, place of residence, municipality of residence, marital status, educational attainment, current employment status, household wealth status, parity and the number of household members. Based on the available literature, age was categorised into the following three categories: (1) 15–24 years, (2) 25–34 years and (3) 35–49 years.⁴⁰ The number of household members was dichotomised, based on the median value of 6, into two categories: (1) ≤6 and (2) >6. Wealth index was calculated through principal component analysis technique based on household construction material, water source and sanitation facility, and possession of assets like bicycles, TVs, etc. Household wealth status was derived after dividing this wealth index into quintiles.^{35–41} The study variables along with their categories are outlined in online supplemental table 1.

Data analysis

At first, the background characteristics of the respondents were determined by descriptive analysis and the findings were presented in frequency and percentage. Then, a χ^2 test was conducted to find the possible relationship of BMI with the frequency of TV viewing and other covariates. During the analyses, the sample weight used in the TLDHS was adjusted for. To find the possible correlates of overweight and obesity, multivariable multilevel ordered logistic regression was carried

out. The multilevel regression was performed considering the hierarchical nature of the DHS data.^{42–44} Both crude odds ratio (COR) and adjusted odds ratio (AOR) were reported with 95% CI. Additionally, we performed multilevel ordered logistic regression analyses considering normal BMI (18.5–22.99 kg/m²) as the reference category. Moreover, linear regression analyses were conducted to assess the relationship between BMI and the frequency of watching TV. Furthermore, the association between underweight (<18.5 kg/m²) (compared with normal BMI) and frequency of watching TV was assessed. Variance inflation factor (VIF) was used to determine possible multicollinearity among the covariates. The existence of significant multicollinearity was defined by a VIF greater than 5,⁴⁵ however, no significant multicollinearity was detected. All the statistical analyses were performed through Stata V.14.0 (StataCorp).

Reporting checklist

The STROBE cross-sectional checklist⁴⁶ was utilised while writing the manuscript.

Patient and public involvement

No patient involved.

Findings prevalence and distribution of BMI categories

This study analysed the data from a weighted sample of 11 398 Timorese women of reproductive age (15–49 years) to assess the possible relationship between frequency of TV viewing and being overweight or obese. The prevalences of overweight and obesity among the respondents were found to be 15.7% (95% CI: 14.7% to 16.7%) and 3.8% (95% CI: 3.3% to 4.3%), respectively, whereas the combined prevalence of both overweight and obesity was 19.4% (95% CI: 18.3% to 20.6%).

The distribution of BMI across different categories of respondents' background characteristics is outlined in table 1. The majority of women were between 15 and 24 years of age (41.2%), hailed from rural areas (67.1%) and belonged to the municipality of *Dili* (25.1%). Although just over one-fifth (21.8%) of the respondents did not receive any formal education, more than half (52.0%) completed secondary education. Around two-thirds of the respondents (65.8%) were in employment at the time of the survey. In terms of wealth status, approximately, a quarter of the respondents (24.2%) belonged to the 'richest' quintile of the wealth index. Around half of the respondents (42.4%) were nulliparous, whereas 29.6% had a parity of more than three. Around half of the respondents (47.7%) had more than six members in their households. Although 41.2% of the respondents, reportedly, did not watch TV at all, 38.0% watched TV at least once a week.

Relationship of overweight and obesity with background characteristics

Statistically significant differences were found among the BMI of women across all the covariates, except the number of household members. Prevalence of overweight and

**Table 1** Distribution of BMI across categories of background characteristics of the respondents (N=11 398)

Background characteristics	N	%	BMI status (%)		
			BMI <23 kg/m ²	23 kg/m ² ≥ BMI < 27.5 kg/m ²	BMI ≥27.5 kg/m ²
Age group (years)*					
15–24	4694	41.2	91.2	7.4	1.4
25–34	3216	28.2	75.6	19.8	4.7
35–49	3488	30.6	70.9	23.0	6.1
Place of residence*					
Rural	7649	67.1	83.8	13.5	2.6
Urban	3749	32.9	73.9	20.0	6.1
Municipality of residence*					
Aileu	482	4.2	86.5	11.0	2.5
Ainaro	459	4.0	84.6	13.6	1.8
Baucau	1161	10.2	77.7	18.7	3.6
Bobonaro	854	7.5	86.3	10.8	2.9
Covalima	690	6.1	73.2	22.4	4.3
Dili	2856	25.1	74.1	19.7	6.2
Ermera	1090	9.6	91.4	7.5	1.2
Lautem	586	5.1	83.4	14.8	1.8
Liquiçá	670	5.9	88.3	9.9	1.8
Manatuto	491	4.3	75.5	18.3	6.3
Manufahi	628	5.5	81.6	14.6	3.7
SAR of Oecussi	697	6.1	87.2	10.8	2.0
Viqueque	734	6.4	75.0	20.5	4.5
Highest educational status*					
No formal education	2480	21.8	84.7	13.2	2.1
Primary	1749	15.4	77.1	18.0	4.9
Secondary	5925	52.0	80.9	15.3	3.9
Higher	1243	10.9	75.7	19.3	5.1
Currently employed*					
No	7497	65.8	82.4	14.3	3.3
Yes	3901	34.2	77.0	18.3	4.8
Household wealth status*					
Poorest	1880	16.5	88.0	10.3	1.7
Poorer	2056	18.0	86.5	11.0	2.5
Middle	2190	19.2	82.0	15.9	2.1
Richer	2512	22.0	77.4	17.5	5.1
Richest	2759	24.2	72.9	20.9	6.3
Marital status*					
Single	4559	40.0	91.3	7.2	1.5
Currently married	5873	51.5	72.0	22.4	5.6
Separated/divorced/widowed	971	8.5	82.0	14.7	3.3
Parity*					
0	4834	42.4	90.5	7.9	1.6
1	1023	9.0	83.3	13.0	3.7
2	1109	9.7	74.6	21.4	4.0
3	1060	9.3	70.9	23.5	5.7

Continued

Table 1 Continued

Background characteristics	N	%	BMI status (%)		
			BMI <23 kg/m ²	23 kg/m ² ≥ BMI < 27.5 kg/m ²	BMI ≥27.5 kg/m ²
>3	3372	29.6	70.5	23.3	6.2
Number of household members					
≤6	5960	52.3	80.8	15.9	3.3
>6	5438	47.7	80.3	15.4	4.4
Frequency of viewing television*					
Not at all	4697	41.2	85.3	12.5	2.3
Less than once a week	2376	20.8	80.0	16.2	3.8
At least once a week	4325	38.0	75.8	18.8	5.4

Categorical variables were analysed via χ^2 test. Asterisks (*) denote level of statistical significance, derived from the χ^2 test.

*P value <0.001.

BMI, body mass index; n, frequency.

obesity was the highest among women aged 35–49 years ($p<0.001$) and women who belonged to the municipalities of Covalima and Viqueque ($p<0.001$). Urban areas had a higher prevalence of overweight and obesity compared with rural areas (overweight: urban 20.0% vs rural 13.5%; obesity: urban 6.1% vs rural 2.6%; $p<0.001$). Women whose educational attainment was beyond the secondary level had the highest prevalence of overweight and obesity ($p<0.001$). A higher prevalence of overweight and obesity was observed in the higher quintiles of wealth index, with the ‘richest’ having the highest prevalence of all ($p<0.001$). Furthermore, married women had a higher prevalence than unmarried ones ($p<0.0001$). Women who watched TV at least once a week had a higher prevalence of overweight and obesity than other groups ($p<0.0001$) (table 1).

Correlates of overweight and obesity

In the ordered logistic regression model, the normal and underweight category (BMI <23 kg/m²) was held as the reference group, while the possible correlates of overweight or obesity were identified based on COR and AOR calculations (table 2). After controlling for the covariates, age, type of settlement, municipality, educational attainment, wealth and marital status, and frequency of TV viewing were all found to be the statistically significant correlates of overweight or obesity. On the contrary, household size, employment status and parity did not show any statistically significant relationship with TV viewing frequency.

The difference between urban and rural women in terms of TV viewing frequency is illustrated in figure 1 (see online supplemental file 1). The proportion of respondents who watched TV at least once a week was significantly higher in urban areas compared with rural areas (urban: 64.1% vs rural: 39.5%, $p<0.0001$).

Relationship between frequency of watching TV and overweight and obesity after stratification by type of settlement

Overall, women who watched TV at least once a week had 1.3 times the odds of being overweight or obese compared

with women who never watched TV (AOR: 1.3, 95% CI: 1.1 to 1.5; $p<0.001$). (table 2). After stratification by type of settlement (urban/rural) (table 3) and adjustment for other covariates (eg, age, municipality of residence, the status of wealth and employment, educational and marital status, parity and household size) that were found to have a statistically significant association with overweight and obesity in bivariate analyses ($p<0.05$), it was found that rural women who watched TV at least once a week had higher odds of being overweight or obese than those who did not watch TV at all (AOR: 1.5, 95% CI: 1.2 to 1.8; $p<0.001$). Conversely, no significant association between overweight and obesity and the frequency of watching TV was observed among urban women (table 3). The logistic regression results found in the urban and rural strata, separately, are presented in online supplemental tables 2 and 3.

Similar estimates were generated while comparing the odds of overweight and obesity while keeping normal BMI as a reference category (table 4). The detailed models are shown in online supplemental tables 4–6.

Linear regression also revealed an increase in BMI as the frequency of watching TV increases. However, stratification yielded significant result only in rural areas (table 5). The detailed models are shown in online supplemental tables 7–9.

Watching TV at least once a week was associated with 10% lower odds of underweight compared with not watching TV at all (online supplemental table 10).

DISCUSSION

To the best of our knowledge, this is the first-ever study on Timor-Leste that analysed a nationally representative DHS dataset to investigate the association between frequency of TV watching and overweight and obesity among women of reproductive age. The data from a weighted sample of 11 398 Timorese women revealed a statistically significant association between frequency of

**Table 2** Crude and adjusted ORs for factors associated with overweight and obesity (BMI ≥ 27.5 kg/m²), compared with normal BMI or underweight (BMI < 23 kg/m²) among Timorese women of reproductive age

Background characteristics	COR	95% CI		AOR	95% CI	
		Lower limit	Upper limit		Lower limit	Upper limit
Age group (years)						
15–24	Ref			Ref		
25–34	3.7*	3.2	4.2	1.9*	1.6	2.3
35–49	5.0*	4.4	5.7	2.3*	1.9	2.9
Place of residence						
Rural	Ref			Ref		
Urban	1.8*	1.6	2.1	1.4*	1.2	1.6
Province of residence						
Aileu	Ref			Ref		
Ainaro	1.3	0.9	1.8	1.2	0.9	1.7
Baucau	1.8*	1.3	2.5	1.5‡	1.1	2.0
Bobonaro	1.1	0.8	1.5	0.9	0.6	1.2
Covalima	2.1*	1.5	2.9	1.7†	1.3	2.3
Dili	2.2*	1.6	2.9	1.2	0.9	1.7
Ermera	0.7	0.5	1.0	0.7	0.5	1.0
Lautem	1.3	1.0	1.9	1.0	0.7	1.4
Liquiçá	0.9	0.6	1.2	0.8	0.6	1.2
Manatuto	2.1*	1.5	2.9	1.6†	1.2	2.2
Manufahi	1.5‡	1.1	2.1	1.3	0.9	1.7
SAR of Oecussi	1.0	0.7	1.5	0.8	0.5	1.1
Viqueque	2.0*	1.5	2.8	1.8*	1.3	2.5
Highest educational status						
No formal education	Ref			Ref		
Primary	1.6*	1.4	1.9	1.7*	1.4	2.0
Secondary	1.1	1.0	1.3	1.5*	1.3	1.8
Higher	1.4†	1.2	1.7	1.4†	1.1	1.8
Currently employed						
No	Ref			Ref		
Yes	1.6*	1.5	1.8	1.1	1.0	1.2
Household Wealth index						
Poorest	Ref			Ref		
Poorer	1.1	0.9	1.4	1.1	0.9	1.4
Middle	1.5*	1.2	1.8	1.3†	1.1	1.6
Richer	2.1*	1.7	2.5	1.6*	1.3	2.0
Richest	2.7*	2.2	3.2	1.9*	1.5	2.4
Marital status						
Single	Ref			Ref		
Currently married	4.7*	4.1	5.3	2.9*	2.2	3.8
Separated/divorced/widowed	2.9*	2.3	3.5	2.2*	1.6	3.0
Parity						
0	Ref			Ref		
1	1.9*	1.5	2.3	0.6†	0.5	0.8
2	3.1*	2.6	3.7	0.9	0.7	1.2

Continued

Table 2 Continued

Background characteristics	COR	95% CI		AOR	95% CI	
		Lower limit	Upper limit		Lower limit	Upper limit
3	4.5*	3.8	5.3	1.1	0.8	1.5
>3	4.7*	4.1	5.3	1.1	0.8	1.5
Number of household member						
≤6	Ref			Ref		
>6	0.9	0.9	1.0	1.0	0.9	1.1
Frequency of viewing television						
Not at all	Ref			Ref		
Less than once a week	1.5*	1.3	1.7	1.2‡	1.0	1.4
At least once a week	1.7*	1.5	1.9	1.3*	1.1	1.5

Results are based on ordered logistic regression. Asterisks (*) denote level of statistical significance.

*P value<0.001.

‡P value<0.01.

‡P value<0.05.

AOR, adjusted odds ratio; BMI, body mass index; COR, crude odds ratio.

TV viewing and being overweight or obese. However, when stratified by the type of settlement (urban/rural), the statistical significance stood only for the Timorese women belonging to the rural stratum.

The prevalence of overweight and obesity using Asian criteria-based BMI cut-offs ($BMI \geq 23 \text{ kg/m}^2$) among the Timorese women of reproductive age was found to be 19.4%, which is lower than that of the neighbouring Southeast Asian countries: Vietnam,⁴⁷ Cambodia,⁴⁸ Malaysia,⁴⁹ Laos⁵⁰ and Thailand.⁵¹ Given that Timor-Leste is arguably the least developed country in this region,²² the comparatively lower proportion of underweight or obesity is understandable. Despite going through epidemiological transitions, undernourishment is still the bigger problem among Timorese women of reproductive age.²³ However, the methodological contrasts among studies of different Southeast Asian countries (eg, BMI cut-offs, study population, and sampling and measurement techniques) may limit direct comparison. In terms of the correlates; however, higher age groups,^{47 50} higher

wealth status⁴⁷ and urban settlement^{50 52} were previously found to have significantly higher odds of overweight or obesity, which is consistent with the present study results.

The present study found a positive and statistically significant association between frequency of TV viewing and being overweight or obese among women of reproductive age. A number of studies over the years, conducted on people of different age groups, have established a similar positive association between the two in Western^{53–56} as well as Eastern settings.^{57–60} This observed positive association can be explained through at least two possible mechanisms. First, TV watching time may replace the time that could have been used for exercise or discretionary physical activities; this may result in a reduction in overall energy expenditure and subsequently lead to weight gain.^{54 55 61} Decreased energy expenditure and its consequent increase in sedentariness were found to have detrimental metabolic repercussions on adults irrespective of their meeting the recommended physical activity guidelines, posing negative implications on their BMI status.⁶² In particular, people in developing countries are reportedly shifting from an active lifestyle towards sedentariness due to greater access to mechanical appliances, TV being one of them.⁶³ Being a developing country itself, Timor-Leste might not be an exception to such a shift, and Timorese women may be resorting to TV viewing as their primary form of recreation rather than engaging in physically demanding recreational or outdoor activities. Second, TV viewing time is also hypothesised to result in increased energy intake.^{24 27 55 61} Watching TV was found to be associated with the urge to consume more savoury snacks and high-calorie drinks.^{64 65} These unhealthy dietary practices, while watching TV, are hypothesised to be related to abdominal obesity in women.⁵⁵ One of the factors that might drive this tendency is the abundance of TV programmes with commercials or advertisements

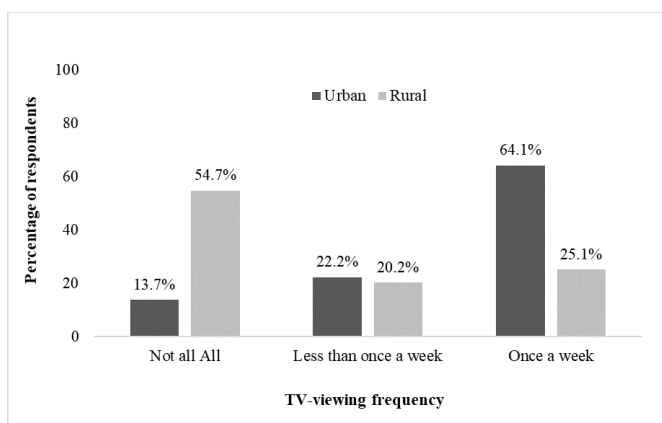


Figure 1 Percentage of sample (n=11 398) in urban and rural areas across three categories of TV viewing frequency.

Table 3 Association between frequency of watching TV and overweight and obesity (after stratification by type of settlement) among women of reproductive age in Timor-Leste

Frequency of watching television	COR (95% CI)	AOR (95% CI)
Urban areas		
Not at all	Reference	Reference
Less than once a week	1.3* (1.0 to 1.6)	1.1 (0.8 to 1.4)
At least once a week	1.3* (1.0 to 1.6)	1.1 (0.8 to 1.4)
Rural areas		
Not at all	Reference	Reference
Less than once a week	1.3† (1.1 to 1.6)	1.3† (1.0 to 1.5)
At least once a week	1.7* (1.5 to 2.0)	1.5* (1.2 to 1.8)
Overall		
Not at all	Reference	Reference
Less than once a week	1.5* (1.3 to 1.7)	1.2‡ (1.0 to 1.4)
At least once a week	1.7* (1.5 to 1.9)	1.3* (1.1 to 1.5)

Results are based on ordered logistic regression and adjusted for age, place of residence, municipality of residence, highest educational status, current employment and marital status, Wealth index, parity and number of household members; women having BMI <23 kg/m² were held as the reference group. Asterisks (*) denote level of statistical significance.

*P value<0.001.

†P value<0.01.

‡P value<0.05.

AOR, adjusted odds ratio; COR, crude odds ratio.

for energy-dense foods,^{66 67} which may determine dietary choices in other parts of the day.⁶⁸ A content analysis study on selected Nepali and Indian TV channels found roughly 25% of broadcasted commercials to be promoting prepared or packaged food with low

nutritional value.⁶⁹ Besides, these commercials are more likely to reach the ones spending a considerable amount of time in front of the TV and entice them through attractive communication techniques to purchase and consume obesogenic food products, which, in combination with

Table 4 Association between frequency of watching TV and overweight and obesity (after stratification by type of settlement) among women of reproductive age in Timor-Leste, compared with normal BMI

Frequency of watching television	COR (95% CI)	AOR (95% CI)
Urban areas		
Not at all	Reference	Reference
Less than once a week	1.3‡ (1.0 to 1.6)	1.0 (0.8 to 1.3)
At least once a week	1.2‡ (1.0 to 1.5)	1.0 (0.7 to 1.2)
Rural areas		
Not at all	Reference	Reference
Less than once a week	1.4† (1.2 to 1.7)	1.2‡ (1.0 to 1.5)
At least once a week	1.7* (1.4 to 2.0)	1.4† (1.2 to 1.7)
Overall		
Not at all	Reference	Reference
Less than once a week	1.5* (1.3 to 1.7)	1.2‡ (1.0 to 1.4)
At least once a week	1.7* (1.5 to 1.9)	1.3* (1.1 to 1.5)

Results are based on ordered logistic regression and adjusted for age, place of residence, municipality of residence, highest educational status, current employment and marital status, wealth index, parity, and number of household members; women having BMI 18.5–23 kg/m² were held as the reference group. Asterisks (*) denote level of statistical significance.

*P value<0.001.

†P value<0.01.

‡P value<0.05.

AOR, adjusted odds ratio; BMI, body mass index; COR, crude odds ratio.

Table 5 Association between frequency of watching TV and BMI (after stratification by type of settlement) among women of reproductive age in Timor-Leste

Frequency of watching television	Crude beta-coefficient (95% CI)	Adjusted beta-coefficient (95% CI)
Urban areas		
Not at all	Reference	Reference
Less than once a week	0.26 (−0.09 to 0.62)	0.12 (−0.22 to 0.47)
At least once a week	0.45‡ (0.13 to 0.76)	0.29 (−0.04 to 0.61)
Rural areas		
Not at all	Reference	Reference
Less than once a week	0.35* (0.12 to 0.57)	0.32‡ (0.09 to 0.55)
At least once a week	0.60* (0.39 to 0.80)	0.43* (0.19 to 0.67)
Overall		
Not at all	Reference	Reference
Less than once a week	0.42* (0.24 to 0.60)	0.27‡ (0.08 to 0.46)
At least once a week	0.67* (0.51 to 0.84)	0.41* (0.23 to 0.60)

Results are based on linear regression and adjusted for age, place of residence, municipality of residence, highest educational status, current employment and marital status, wealth index, parity, and number of household members. Asterisks (*) denote level of statistical significance.

*P value<0.001.

†P value<0.01.

‡P value<0.05.

BMI, body mass index.

their sedentary behaviour, make them prone to being overweight and obese.²⁵

Nevertheless, after stratification of TV viewing status based on settlement type (urban/rural), the statistical significance of its relationship with BMI held up only in the rural stratum. Conversely, in the urban stratum, although watching TV ‘at least one a week’ gave one higher odds of being overweight or obese, it lacked statistical significance, which contrasts prior studies on this aspect.⁴⁰ This apparent contradiction may be explained from two different angles. First, the statistical significance found in the rural stratum could be because the ongoing epidemiological and demographic transitions and gradual increase in gross national income in the underdeveloped and developing countries may be resulting in gradual, yet meaningful diffusion of urban behavioural risk factors to rural areas, such as the adoption of a sedentary lifestyle, increased screen time, consumption of obesogenic food and greater reliance on the mechanised systems for routine chores and transportation.^{27 70} Second, the relationship lacked statistical significance in the urban stratum possibly because of other unknown behavioural practices that might have confounded the relationship. The ability of this study to assess the relationship was constrained by the fact that frequency of TV watching was the only available measure of screen time and due to the lack of data, our study could not control for other potential confounders or mediators (eg, dietary habit, physical activity, screen time other than TV watching) of the relationship between TV viewing and overweight or obesity in urban areas.

Much as this study provides useful insights on the potential correlates of overweight and obesity and the possible mechanism of its relationship with TV viewing frequency, it also highlights the need to interpret its finding cautiously in

light of potential limitations. First, the cross-sectional nature of this study prevents us from drawing causal conclusions about the hypothesised relationship between TV viewing and overweight and obesity. Nonetheless, this hypothesis was previously tested in prospective cohort studies that found temporal relationships between frequency of TV watching and incidence of overweight or obesity^{24 25 71} as well as in an experimental study that found moderation of the TV viewing time to have a protective association with BMI,⁷² suggesting that reverse causation would be unlikely. Second, a self-reported measurement of TV viewing frequency/duration may have led to a reporting bias. Third, due to the lack of data, some of the potentially important behavioural risk factors of BMI (eg, inactivity or sedentary status, poor dietary habit, tobacco and alcohol consumption) could not be adjusted to discern the strength of the independent relationship between TV viewing and overweight and obesity. Moreover, a more precise duration of TV viewing and the nature of the media content that Timorese women are exposed to may need to be looked at in future studies.²⁷

Notwithstanding the aforementioned limitations, this study is the first one to assess the relationship of TV viewing frequency with overweight and obesity in Timor-Leste, where the prevalence of overnutrition is on the rise due to ongoing epidemiological transition. Moreover, this study analysed a nationally representative survey dataset with a high response rate (97%), hence the findings are generalisable to a great extent. Moreover, the TLDHS 2016 utilised validated questionnaires, calibrated measurement tools and well-trained enumerators and technicians, limiting the chance of measurement error. Furthermore, this study contributes to generating representative prevalence estimates of BMI categories and their cross-sectionally associated factors among Timorese women of reproductive age,



thereby helping to widen the knowledge of some of the potential drivers of malnutrition in this context.

CONCLUSION

The ongoing epidemiological transition in Timor-Leste makes this country susceptible to a forthcoming dual burden of malnutrition. Compared with other groups, the Timorese women of reproductive age are more prone to suffer from complications of overweight and obesity due to their additional gestational and obstetric issues. This study demonstrates TV viewing frequency to be a statistically significant correlate of overweight and obesity among that age group. Therefore, intervention planners should incorporate behavioural change communication messages regarding dietary and physical activity reforms in the existing TV programmes to leverage TV viewing time, if not advice for replacing the screen time with physically demanding discretionary activities.

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