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Breakfast skipping as a risk correlate of overweight and obesity in school-going ethnic Fijian adolescent girls

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Abstract

The prevalence of overweight and obesity has increased globally, and population data suggest that it is also increasing among ethnic Fijian youth. Among numerous behavioural changes contributing to overweight in youth residing in nations undergoing rapid economic and social change, meal skipping has not been examined as a potential risk factor. The study objectives were to assess the prevalence of overweight, obesity, and breakfast skipping and examine their cross-sectional association in a community sample of school-going ethnic Fijian adolescent girls (n=523). We measured height and weight, and assessed dietary patterns, eating pathology, dimensions of acculturation, and other socio-demographic and cultural data by self-report. We observed a high prevalence of both overweight (41%, including 15% who were obese) and breakfast skipping (68%). In addition, in multivariable analyses unadjusted for eating pathology, we found that more frequent breakfast skipping was associated with greater odds of overweight (odds ratio (OR)=1.15, confidence interval (CI)=1.06, 1.26, $p<0.01$) and obesity (OR=1.18, CI=1.05, 1.33, $p<0.01$). Regression models adjusting for eating pathology attenuated this relation so that it was non-significant, but demonstrated that greater eating pathology was associated with greater odds of both overweight and obesity. Future research is necessary to clarify the relation among breakfast skipping, eating pathology, and overweight in ethnic Fijian girls, and to identify whether breakfast skipping may be a modifiable risk factor for overweight in this population.

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Keywords

overweight; obesity; Fiji; breakfast skipping; adolescents

INTRODUCTION

The global prevalence of overweight and obesity among children and adolescents has increased markedly over the past decade,[1–4] affecting populations of both higher and lower-middle income countries,[5] and, in particular, those in Pacific populations.[6–8] It has been estimated that 10% of school-age children are overweight or obese worldwide, with the Americas leading at 32%, followed by Europe (20%), and then the Middle East (16%).[9] In Fiji, epidemiological survey data suggest that the prevalence of overweight has increased in children between 1993 and 2004.[10]

Obesity in childhood and adolescence is associated with a number of significant comorbidities, such as low self-esteem in childhood,[11] as well as type 2 diabetes, hypertension, and cardiovascular disease.[12–14] These adverse effects place potentially enormous demands on health care services, particularly in low to middle income countries such as Fiji, where diet-related non-communicable diseases (NCDs) accounted for almost 39% of all treatment costs as well as 82% of all deaths in 2002.[10,15] With the combined prevalence of overweight and obesity in ethnic Fijian female adults at close to 76% in 2004,[10] identifying modifiable behavioural risk factors for overweight may suggest preventive strategies that can improve the health of Fijians.

The numerous behavioural risk factors contributing to the elevated risk for childhood overweight and obesity include those that increase energy intake and decrease expenditure. In populations undergoing economic transition, increased energy consumption has been related to the increased availability and consumption of energydense foods (i.e., facilitated by distribution of processed food; marketing promotion of fast foods, sweetened beverages, and imported products; and enhanced capacity for food storage).[16,17] Moreover, decreased energy expenditure has been related to decreased physical activity in the setting of (1) better accessibility to motorised transport; (2) reduced demand for physical activity for subsistence and household management; and (3) increased sedentary behaviour (e.g., through the marketing and availability of electronic-based entertainment displacing more physically demanding activities).[18,19]

Many of these behavioural risk factors have been well-described, if not yet well controlled, in high income populations, but remain incompletely understood in low and middle income nations. Disrupted meal patterns, for instance, have received relatively less attention in settings characterised by rapid economic transition.[20–22] Urban migration for employment, increasing consumption of purchased foods, changing access and distribution patterns for foods grown or fished by household members and displacement of mealtimes related to employment schedules may elevate risk in these populations.[22,23] Daily meal frequencies, and breakfast skipping in particular, have been linked to risk for overweight and obesity in UK, US, and Australian populations, and are associated with female gender, lower SES, urban environments, and older age.[24–26] Cross-sectional and longitudinal studies have

shown that regularly skipping breakfast is associated with greater body mass index (BMI) in all age groups;[27–33] however, the mechanisms that might explain the relation between breakfast consumption and body weight are not yet well understood.[34] Studies have linked breakfast consumption to better overall nutrition,[35] higher levels of physical activity[36] and overall quality of life in children and adolescents.[37] However, it remains unclear whether breakfast skipping plays a causal role in overweight or is associated with other factors impacting BMI such as parental involvement in food decisions.[38]

In summary, meal skipping and other extreme dieting behaviours have been linked to overeating and overweight in UK, US, and Australian populations. Although data support the high prevalence of overweight among ethnic Fijian adults[10] and an increase in disordered eating among ethnic Fijian adolescent girls concomitant with modernisation,[39,40] we could identify no published studies that examine the prevalence of breakfast skipping and its correlation with overweight in ethnic Fijian youth. Therefore the aims of this study were (1) to examine the prevalence of breakfast skipping, overweight, and obesity in a school-going community sample of adolescent ethnic Fijian girls; (2) to examine the socio-demographic risk correlates of breakfast skipping in this sample to test our hypothesis that greater Western/global cultural orientation and engagement (in contrast to ethnic Fijian cultural orientation and engagement) would be associated with breakfast skipping; and (3) to evaluate the hypothesis that breakfast skipping would be cross-sectionally associated with elevated odds for overweight and obesity in this sample. Consistent with the findings of prior studies in US, UK, and Australian populations,[27–33] we predicted that breakfast skipping would be positively associated with overweight status in this ethnic Fijian population.

MATERIALS AND METHODS

Study design and setting

We analysed data from a cross-sectional self-report survey and anthropomorphic data collected as part of the HEALTHY Fiji Study, an investigation of the impact of social transition on behavioural health outcomes in ethnic Fijian adolescent girls. We collected the study data in June and July 2007 on the main island of Viti Levu, in a region characterised by linguistic and cultural homogeneity among ethnic Fijian residents. However, of key interest for this study's aims, the same region also has substantial variation in transportation and communications infrastructure. The variation in social exposures stemming from this heterogeneous social environment allows their relation to health behaviours and outcomes to be examined.

Study sample

The study sample comprised ethnic Fijian adolescent girls, ages 15–20 years, enrolled in four consecutive grades in the twelve provincial secondary schools registered in one administrative sector of the Fiji Ministry of Education. We enrolled a total of 523 eligible study participants during the data collection period, representing a response rate of 71%.

Study procedures and measures

We assessed socio-demographic, health risk behaviour, and other psychological data cross-sectionally with a battery of self-report assessments offered in English or the local vernacular (Fijian) language. Anthropomorphic measurements (height and weight) were taken at the same time. Retest data were collected to evaluate reliability of measures within approximately one week after Time 1 from a sub-sample drawn from all participants present on the retest site visit day in three of the schools who had completed the assessment during the previous visit (n=81; 100% response rate). Only measures of relevance to the present study are discussed below. A description of study procedures, including item development, translation, and back-translation, and orientation to the self-report questionnaire content and format by the bilingual study team, and informed parental consent and youth assent has been reported elsewhere.[41,42]

Socio-demographics

Socio-demographic data on age and boarding status were assessed by self-report items developed for this study. Peri-urban/rural school location was classified by the investigators based on proximity and ease of access to an urban area. We classified those participants who reported living in a household with at least each of four key household appliances and services (electricity, running water, a gas stove, and a refrigerator) as living in relatively high material wealth compared with respondents lacking one or more of these items or services (defined here as “low relative material wealth”).

Overweight and obesity

We measured height and weight using standardised protocols on the day of the self-report assessment. Students wore lightweight clothing and removed their shoes. We measured weight to the nearest 0.2 kg on a digital scale, and adjusted for the estimated weight of clothing by subtracting 0.5 kg. We measured height to the nearest millimetre with a portable stadiometer and rounded this value to the nearest centimetre for BMI calculation.

We assessed the appropriateness of weight for height and age as follows: first, we calculated BMI as weight (kg) divided by height (m) squared. Next, because BMI is expected to increase as children and adolescents mature, we evaluated appropriateness of BMI for age, gender, and height by calculating percentile ranking according to WHO adolescent anthropomorphic standards.[43] For participants aged 15–19 years, we defined overweight as ≥85th percentile, and obesity as ≥95th percentile, as recommended by the WHO Expert Committee on Physical Status.[44] For participants over 19 years of age, we followed WHO normative standards for the adult classification of overweight (BMI ≥25) and obesity (BMI ≥30). Although suggested cut points for overweight and obesity for Polynesians differ from WHO standards,[45] in the absence of specific data for ethnic Fijians we followed WHO normative standards for adults to classify participants over 19 years of age (n=2).

Breakfast skipping

We assessed breakfast skipping based on response to a single, Likert-style item, “How many days in a week (on average) do you skip breakfast?” with response options ranging from 0 to 7 days (intraclass correlation coefficient (ICC)=0.66). We additionally examined breakfast

skipping as a dichotomous variable with two different cut points [i.e., no weekly breakfast skipping versus any weekly breakfast skipping on average (kappa (κ)=0.69) and breakfast skipping less than thrice weekly versus three or more times weekly on average (κ=0.60)].

Definitions of breakfast skipping vary widely across studies and feature differential methodological costs and benefits. These inconsistencies present a challenge when evaluating and comparing studies as it has been shown that whether or not an association exists between breakfast skipping and BMI can potentially depend on how breakfast skipping is defined.[46] For example, breakfast skipping assessed on a dietary survey day may accurately represent point prevalence but not reflect seasonal or other fluctuation in dietary habits over time. Other studies assessing breakfast skipping on a specific number of days per week or other defined time period may better capture such fluctuations but are susceptible to recall biases. Lastly, studies assessing the construct in more qualitative terms[34] capture participants' self-perceptions as breakfastskippers, which may or may not accurately correspond to actual meal consumption frequency.

Parental/guardian involvement

We assessed parental involvement with a composite variable based on three items relating to parents' or guardians' understanding of "problems and worries," knowledge of how free time was spent, and checking in about homework completion, drawn from the core module content on protective factors of the Global School-based Student Health Survey (GSHS).[47] The Cronbach's alpha coefficient, a summary measure of the shared variation among all three parental involvement items, demonstrated adequate internal consistency (α=0.67) among study participants. The ICC (0.60) demonstrated adequate one-week retest reliability in this sample.

Western/global and ethnic Fijian cultural orientation and engagement

We assessed a broad range of dimensions of both Western/global and ethnic Fijian cultural orientation and engagement for these exploratory analyses to test our hypothesis that relatively greater Western/global cultural orientation and lower ethnic Fijian traditional cultural orientation would be associated with non-traditional dietary patterns, such as breakfast skipping. Although there is culturally sanctioned breakfast skipping associated with some periods of religious fasting (related to local Christian traditions), traditional dietary patterns for ethnic Fijians include meals in the morning, at midday, and in the evening. Afternoon tea with a snack is also frequently served.

Given the exploratory nature of this analysis, we examined each of 11 dimensions of acculturation (including those relating to both Western/global and ethnic Fijian cultural orientation and engagement) in bivariate analyses with breakfast skipping. Development, psychometric properties, and example items for these multiple dimensions of cultural orientation are discussed in detail elsewhere. For this study, we also created a combined measure of the perceived feasibility of and desire for upward social mobility from two of these dimensions given their high correlation (r=0.61, $p<0.001$). This latter combined measured had adequate internal consistency (α=0.88) and one-week retest reliability (ICC>0.7).

Eating pathology

We assessed the presence and severity of eating pathology with the Eating Disorder Examination Questionnaire (EDE-Q) global score.[48] This measure has established validity and reliability as a dimensional measure of eating disorder symptomatology in this study sample.[41]

Statistical analysis

Sample and prevalence of key outcomes—We calculated means and standard deviations for continuous variables, and frequencies for categorical variables. We also examined the range and distribution of BMI, BMI percentiles, and breakfast skipping.

Breakfast skipping

The bivariate relation between breakfast skipping and overweight and obesity: For all final regression models we examined breakfast skipping as a continuous variable (average number of breakfasts skipped weekly). However because breakfast skipping is operationalised in various ways in the literature, we additionally examined the bivariate association of breakfast skipping with overweight and obesity using breakfast skipping as a dichotomous variable with two different cut points (i.e., no weekly breakfast skipping versus any weekly breakfast skipping on average and breakfast skipping less than thrice weekly versus three or more times weekly on average).

Correlates of breakfast skipping: Next, we examined the bivariate relations between breakfast skipping and socio-demographic characteristics based on our hypotheses, literature review of risk and protective factors for breakfast skipping, and potential confounders. These were: dimensions of Western/global and ethnic Fijian cultural orientation and engagement, age, periurban school location (versus rural), relative material wealth, boarding at school, parental involvement, and EDE-Q global score. We then retained all variables that approached a statistically significant ($p<0.10$) bivariate relationship with breakfast skipping to build a multivariate linear regression model. This multivariate model was also adjusted for two additional socio-demographic covariates that have been associated with breakfast skipping in previous studies, age and peri-urban school location.[34,49]

Multivariable models relating breakfast skipping to overweight—We next examined the relation between breakfast skipping and overweight in a multivariable logistic regression model by retaining all covariates that approached a statistically significant ($p<0.10$) bivariate relationship with overweight. In addition, we included the potential confounder of relative material wealth. However, we excluded eating pathology for this initial model given the likely bidirectional relationship between eating pathology and overweight and the cross-sectional nature of the data.

Obesity: As a sensitivity analysis, we also examined the relation between breakfast skipping and obesity while adjusting for the same covariates in a second multivariable logistic regression model.

Eating pathology: Next, given the reported associations between meal skipping and eating pathology in other populations,[34,49] we examined two additional exploratory multivariate models for both overweight and obesity. These models retained the covariates as described above and also adjusted for eating pathology as measured by the EDE-Q global score.

Missing data—BMI data were available for each of the 523 participants. We handled missing data on other covariates with listwise deletion; therefore, observations from 504 participants were available for the breakfast skipping regression, and from 517 participants for the overweight and obesity regressions.

Ethics review

The data analyses performed for this study were part of a more comprehensive study protocol that was approved by the Fiji National Research Ethical Review Committee (FN-RERC), the Partners Healthcare Human Subjects Committee, and the Harvard Medical School Committee on Human Studies.

RESULTS

Sample and prevalence of key outcomes

The mean age of this school-going study sample was 16.68 years (SD=1.09 years). Approximately half the study participants attended school in a peri-urban location and half in a rural location, and 59% were classified as having low relative material wealth.

Table 1 summarises the point prevalence of our key outcomes, including BMI and breakfast skipping. BMI followed a normal distribution, and we observed a high prevalence of overweight/obesity; 40.7% of the study sample was classified as overweight including 14.7% who were classified as obese. Breakfast skipping was also common; 68% skipped breakfast at least once per week on average.

Breakfast skipping

The bivariate relation between breakfast skipping and overweight and obesity —Overweight and obese participants were significantly more likely to skip breakfast than normal-weight participants in our study sample (Table 2). This relation was also statistically significant when breakfast skipping was defined dichotomously as “skipped breakfast at least once per week” versus “ate breakfast everyday,” and “skipped breakfast at least three times per week” versus “skipped breakfast two or fewer times per week.”

Correlates of breakfast skipping—The fully adjusted linear regression model, with number of days of breakfast skipping per week as the dependent variable, was statistically significant ($p<0.001$) (Table 3). This model accounted for 12% of the variance in breakfast skipping frequency. Ethnic Fijian cultural values, Western/global cultural *practices* (but not other cultural attributes assessed), and EDE-Q global score were each independently associated with breakfast skipping. Specifically, high endorsement of ethnic Fijian cultural values was associated with *reduced* frequency of breakfast skipping, whereas high endorsement of Western/global cultural practices and higher EDE-Q global scores were

associated with *greater* frequency of breakfast skipping. These findings supported our hypothesis relating Western/global versus traditional ethnic Fijian cultural orientations to non-traditional dietary patterns and are also consistent with literature relating eating pathology to breakfast skipping in other populations.

Multivariable models relating breakfast skipping to overweight

The fully adjusted logistic regression model relating breakfast skipping to overweight was statistically significant against a constant-only model, $\chi^2(6)=31.00$, $p<0.001$, and accounted for 8% of the variance in overweight status, consistent with a small effect (Table 4). Age, perceived feasibility of and desire for upward social mobility, Western/global cultural knowledge and competencies, and breakfast skipping were each independently associated with overweight in this model. Specifically, individuals who were older, endorsed greater perceived feasibility of and desire for upward social mobility, and reported more frequent breakfast skipping (odds ratio (OR)=1.15, 95% confidence interval (CI)=1.06, 1.26, $p<0.01$) had a greater odds of being overweight. However, individuals who endorsed a greater level of Western/global cultural knowledge and competencies were less likely to be overweight.

Obesity—In our sensitivity analysis relating breakfast skipping to obesity in a multivariable logistic regression model, adjusting for the same covariates, we found that this model was also statistically significant against a constant-only model, $\chi^2(6)=39.01$, $p<0.001$, and accounted for 13% of the variance in obesity status, consistent with a medium effect (Table 5). Peri-urban school location, perceived feasibility of and desire for upward social mobility, and breakfast skipping were independently associated with obesity. Specifically, study participants who attended school in peri-urban locations, endorsed greater perceived feasibility of and desire for upward social mobility, and reported more frequent breakfast skipping (OR=1.18, 95% CI=1.05, 1.33, $p<0.01$) had a greater odds of being obese.

Eating pathology—Next, we found that adjusting for eating pathology in these models appeared to attenuate the relation of breakfast skipping to overweight and obesity (Tables 4 and 5). Although the ORs relating breakfast skipping to overweight and obesity, respectively, remained greater than 1.0, these relations were no longer statistically significant after adjusting for the effects of eating pathology.

DISCUSSION

Prevalence of key outcomes

We observed a high prevalence of overweight/obesity at nearly 41% in this study sample of ethnic Fijian adolescent girls. There are considerable adverse health consequences associated with childhood overweight and obesity and identification of modifiable risk factors for overweight, such as unhealthful dietary patterns, can inform local intervention strategies. Therefore, these data on dietary patterns (both breakfast skipping and eating pathology) augment knowledge about other potentially modifiable risk factors identified among ethnic Fijian girls, including poor diet, reduced physical activity, provision of spending money, poor knowledge of a healthy diet and healthy weight loss, suboptimal time management, and reduced parental involvement.[22,50]

We also found that breakfast skipping was prevalent in our study sample, with 68% of participants skipping breakfast at least once per week and 41% skipping breakfast three or more times per week. This prevalence appears high compared with breakfast skipping in US children, where it generally ranges from 10% to 30% depending on age group, gender, race, ethnicity, and how breakfast skipping is defined.[49] However, it appears consistent with the results of a survey of Pacific children aged 5–14 living in New Zealand, in which just 50.3% of female respondents said that they "usually" ate or drank something at home before school in the morning.[51]

Breakfast skipping and shifting social norms

Our finding that the majority of study participants miss breakfast on a regular basis warrants concern. Even setting aside the relation between breakfast skipping and overweight, regular breakfast consumption may have other health and social benefits for children.[34] Although breakfast skipping is common in adolescents across diverse social contexts,[34] globalisation and ensuing social change have been linked to degradation of healthful nutritional practices.[23,52] Changing social norms that may promote obesity are evident in Fiji in shifts in dietary content and quality, level of physical activity, and eating pathology; but the impact of economic transition on meal skipping in Fiji's youth has not previously been evaluated.[22,39,40,53,54]

Our study findings support that the Western/global cultural practices examined in this analysis are associated with increased breakfast skipping whereas they suggest greater endorsement of ethnic Fijian cultural values may be protective against it. Our multivariate model for breakfast skipping also indicates that greater eating pathology, possibly related to modernisation and media access in Fiji,[39,40] is associated with breakfast skipping, consistent with literature linking dieting to reduced breakfast consumption.[55] In other words, our data support that assimilation to Western/global cultural practices may promote a variety of unhealthful dietary attitudes and behaviours among ethnic Fijian girls. In this respect, acculturation among Fiji's youth may mediate or contribute to risk for overweight via degradation of traditional dietary patterns, in addition to its adverse impact on traditional diet.

The relation of breakfast skipping and eating pathology to overweight and obesity

Our finding that breakfast skipping is associated with higher odds of both overweight and obesity is consistent with previous research findings in UK, US, and Australian populations.[34,49] However, we also found that the association between breakfast skipping and overweight/ obesity was attenuated, and no longer statistically significant, after including a covariate for eating pathology in our multivariate regression model. This result suggests that the relationship among breakfast skipping, eating pathology, and obesity may be quite complex. For example, it is possible that eating pathology mediates the relationship between breakfast skipping and overweight. A longitudinal study found that controlling for weight concerns attenuated the prospective relationship between breakfast skipping and 5-year weight gain in a sample of US adolescents,[56] which suggests the hypothesis that eating pathology, in general, rather than breakfast skipping, in particular, promotes weight gain. Alternatively, breakfast skipping may mediate the relationship between eating pathology and

overweight. In the same US sample, dieting in early adolescence also predicted 5-year weight gain, but controlling for breakfast skipping attenuated the relationship.[55] The investigators hypothesised that dieting may promote an unfortunate sequence in which behaviours contributing to weight gain (e.g., binge eating) are ultimately adopted after ineffective weight control behaviours (e.g., meal skipping) fail.[55] A third possibility is that individuals who are already overweight skip breakfast as an intentional weight loss strategy, in which case eating pathology would plausibly mediate the relationship between overweight and breakfast skipping. Indeed, previous studies have found that adolescents who describe themselves as overweight[38,57] and those who report currently trying to lose weight[57] are more likely to report breakfast skipping.

The relation of Western/global cultural exposures to overweight and obesity

Although there is strong evidence that globalisation has adversely impacted the nutritional environment in Pacific Island countries,[23] the multiple ways in which it may promote, mediate, and moderate risk for childhood overweight are incompletely understood. In addition to the concrete and profound changes in food availability, food quality, modes of food acquisition, dietary composition, motorised transport, and economic incentives for urban relocation;[22,23] we join others in drawing attention to the need for further research toward understanding how sociocultural norms,[22,58] and changes associated with globalisation, may be obesogenic.

Measurement of the impact of acculturation is methodologically challenging. Not only is acculturation inconsistently defined and operationalised across studies, it most certainly has multiple dimensions that may vary in their impact on obesity. Our exploratory analysis of sociodemographic variables and dimensions of acculturation that were associated with overweight in our study sample yielded results that suggest complex relations among them. For example we found that peri-urban school location was not associated with an increased odds of overweight, but rather was associated with greater than twofold higher odds of obesity, in both of our multivariable models. Whereas our finding that peri-urban school location is associated with a higher odds of obesity is consistent with previous research findings, and may be explained in part by the increased availability and accessibility of unhealthful food choices in urban environments,[59] our former finding suggests that the impact of urban location on overweight may be mediated through other factors.

We also identified apparent heterogeneity of the impact of various dimensions of acculturation on overweight and obesity. Whereas most of the dimensions we examined were unrelated to either overweight or obesity in our bivariate analyses, self-reported high Western/global cultural knowledge and competencies (relating to knowledge about fitness, healthful diet, and dieting for weight loss, and emulating TV characters' clothing) was associated with a reduced odds of overweight, but not a reduced odds of obesity, in both of our adjusted multivariable models. Moreover, greater ambition for and perceived feasibility of upward social mobility was associated with greater odds of both overweight and obesity in models unadjusted for eating pathology and also with a greater odds of obesity in our model adjusting for eating pathology. In addition, greater eating pathology was associated

with a greater than twofold higher odds of both overweight and obesity in both of our fully adjusted models.

Taken together, our study findings suggest that Western/global cultural exposures may relate to nutritional outcomes in complex ways. These findings also suggest that impact of local ethnic Fijian cultural traditions on present-day nutritional behaviours require further investigation. For example, the ambition for and perceived feasibility of upward social mobility may reflect exposure to Western/global valuation of personal achievement and a flexible social hierarchy, but Fijian girls may receive mixed messages from parents and peers about the relation of body weight to social standing.[60,61]

Limitations and implications for future directions for research on social change and overweight in Fiji

Although our cross-sectional data raise interesting questions about the relation among breakfast skipping, eating pathology, and overweight, and add to the growing literature on this topic, they do not allow examination of competing hypotheses about the direction and temporal sequence of causal effects, if any. Similarly, we are unable to draw causal inference about relations among dimensions of acculturation, breakfast skipping, and eating pathology from these cross-sectional data. These results do, however, suggest the value of future prospective studies utilising hierarchical linear modelling or other techniques that allow for the evaluation of time-varying covariates in populations undergoing rapid social transition, in order to evaluate the direction, mediation, and moderation of effects of changing social norms and dietary patterns on overweight. Understanding the inter-relation among these behaviours may enhance the development of effective strategies for obesity prevention in Fijian youth.

Next, the validity of our assessment of breakfast skipping is limited by our exclusive use of self-report data. These self-report data may be biased by concerns about social desirability or inaccuracies in evaluating routine behaviour. The retest reliability of our breakfast skipping item is reassuring in this regard, but does not establish validity of the self-report. We also only examined a single item to assess breakfast skipping in this analysis. Parental observational data could be included in future research to circumvent this limitation. Finally, our analyses were selective to focus on the impact of breakfast skipping as well as socio-demographic characteristics relating to cultural change and tradition but did not include other known predictors of overweight and obesity, such as physical activity and dietary intake. We have reported elsewhere that the retest reliability for certain nutritional behaviours and physical activity was poor in this study sample.[62] Finally, our findings are restricted to youth within a narrow demographic of Fiji (adolescent ethnic Fijian school-going girls) and cannot be generalised to other demographic strata in Fiji. Clearly, data on overweight, dietary patterns, and their relation are pertinent to all of Fiji's youth as well as adults. In light of the widely shared exposure to a rapidly changing nutritional and social environment, we urge other investigators to consider evaluating dietary patterns in future studies of overweight in Fiji. On the other hand, because rapid social change and Western/global cultural exposures may have differential impact mediated by gender, age, and culture

of origin, we assert that risk and protective factors are best examined relative to specific socio-demographic groups.

Further prospective and qualitative investigation is warranted to examine which social mechanisms may either undermine or sustain traditional healthful meal patterns in Fiji.[22,60] For example, our finding that traditional ethnic Fijian cultural values may be protective against breakfast skipping, may ultimately suggest culturally appropriate strategies to promote healthful dietary patterns by invoking the traditional Fijian cultural premium on care, feeding, and social approval.[22,63]

Further research is necessary to determine whether breakfast skipping has a causal relation to overweight and obesity among ethnic Fijian girls. Replication in a more representative sample as well as prospective data would help to address this question. However, pending further research and given the body of literature relating both breakfast skipping and overweight to adverse health outcomes, our findings suggest that intervention strategies to support awareness and implementation of healthful dietary patterns may be beneficial for ethnic Fijian girls in Fiji. This research might address some of the obstacles to breakfast consumption, particularly the perceived lack of time to consume a healthy breakfast every day. Given the known health benefits for adults who consume breakfast,[64] parents should be encouraged to serve as role models to their children, fitting daily breakfast around work schedules and other commitments.[38,65–67]

CONCLUSION

We report a high prevalence of overweight in this adolescent female ethnic Fijian study sample; these findings support concerns about the health implications of increasing overweight among Fijian children that have been expressed elsewhere.[10] In addition, we found that breakfast skipping was prevalent in our study sample, and was associated with overweight and obesity in both bivariate analyses and in the multivariate analyses unadjusted for eating pathology. However, our exploratory models adjusting for eating pathology did not support that breakfast skipping was associated with overweight. Notably, eating pathology was significantly associated with overweight and obesity in these multivariate models. Given the possibility that breakfast skipping, eating pathology, and overweight are related in complex ways that are not clear from our cross-sectional study design, further research is necessary to examine whether either breakfast skipping and/or eating pathology have a causal role in overweight in ethnic Fijian girls. That being said, given the compelling evidence from other studies that breakfast skipping is associated with adverse health outcomes, strategies to promote daily breakfast consumption in Fijian youth warrant consideration.

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Table 1

Prevalence of breakfast skipping, overweight and obesity

Variable	Category	n.(%)	Mean (SD)
Age (years)			16.68 (1.09)
BMI (kg/m^2)	≥85th percentile (overweight)	213 (40.7%)	23.96 (3.35) ‡
	≥95th percentile (obese)	77 (14.7%)	(75th percentile)
	≤5th percentile (underweight)	3 (0.6%)	
	>5th percentile or <85th percentile (normal weight)	307 (58.7%) †	
Breakfast Skipping	None	164 (31.7%)	2.20 (2.08)
(frequency/week on average)	1 day	73 (14.1%)	
	2 days	68 (13.2%)	
	3 days	70 (13.5%)	
	4 days	51 (9.9%)	
	5 days	52 (10.1%)	
	6 days	21 (4.1%)	
	7 days	18 (3.5%)	
	≥1 day	353 (68.3%)	
	≥3 days	212 (41.0%)	

Note. BMI=Body Mass Index.

† BMI categories include those respondents aged over 20 years (n=2), because both were classified as having a normal BMI according to WHO normative adult standards.

‡ Mean BMI includes the entire sample (n=523) but average percentile excludes the two 20-year-old respondents.

Table 2

Associations of breakfast skipping with overweight and obesity

Breakfast Skipping	Dichotomised						Continuous	
	Ever Skip (n, % within weight category)			Frequently Skip (n, % within weight category)			Days Per Week Skip	
Variable	**Never Skip**	**≥ 1x/week**	**χ^2(1)**	**< 3x/week**	**≥ 3x/week**	**χ^2(1)**	**Mean (SD)**	***t* (515)**
Overweight			5.26*			5.15*		3.47**
<85th percentile	109 (35.6%)	197 (64.4%)		193 (63.1%)	113 (36.9%)		1.93 (1.94)	
≥85th percentile	55 (26.1%)	156 (73.9%)		112 (53.1%)	99 (46.9%)		2.57 (2.23)	
Obese			5.57*			4.38*		3.17**
<95th percentile	149 (33.7%)	293 (66.3%)		269 (60.9%)	173 (39.1%)		2.08 (2.02)	
≥95th percentile	15 (20.0%)	60 (80.0%)		36 (48.0%)	39 (52.0%)		2.89 (2.29)	

Note.

* $p<0.05$

** $p<0.01$

Table 3

Fully adjusted multivariable linear regression model showing associations with breakfast skipping

Variable	Standardised β	*p*-value
Age (years)	−0.01	0.80
Peri-urban school location	0.01	0.81
Boarding	−0.07	0.08
Parental involvement	−0.07	0.09
Ethnic Fijian cultural values	−0.12	<0.01
Ethnic Fijian cultural food preferences	0.02	0.66
Western/global cultural practices	0.15	<0.01
Perceived orientation toward Western lifestyle and traditions	0.00	0.94
EDE-Q global score	0.22	<0.001

Note. n=504, model $F(9, 494)=7.68$, $p<0.001$, $R^2=0.123$, EDE-Q=Eating Disorder Examination Questionnaire

Table 4

Fully adjusted multivariate logistic regression model showing associations with overweight (defined as BMI ≥ 85th percentile)

Variable	Wald	Odds Ratio	95% Confidence Interval	*p*-value
Without EDE-Q: model $\chi^2(6)=31.00$, $p<0.001$, $R^{2=}.078$				
Age (years)	6.34	1.24	1.05, 1.46	0.01
Peri-urban school location	2.44	1.35	0.93, 1.97	0.12
Low relative material wealth	2.72	0.73	0.50, 1.06	0.10
Perceived feasibility of and desire for upward social mobility	5.03	1.27	1.03, 1.57	0.03
Perceived Western/global cultural knowledge and competencies	4.05	0.82	0.68, 1.00	0.04
Breakfast skipping	10.06	1.15	1.06, 1.26	<0.01
With EDE-Q: model $\chi^2(7)=100.61$, $p<0.001$, $R^{2=}.239$				
Age (years)	3.00	1.17	0.98, 1.40	0.08
Peri-urban school location	2.23	1.36	0.91, 2.03	0.14
Low relative material wealth	1.81	0.76	0.50, 1.14	0.18
Perceived feasibility of and desire for upward social mobility	1.16	1.13	0.90, 1.42	0.28
Perceived Western/global cultural knowledge and competencies	7.43	0.75	0.61, 0.92	<0.01
Breakfast skipping	1.63	1.06	0.97, 1.17	0.20
EDE-Q global score	58.6	2.27	1.84, 2.81	<0.001

Note. n=517, EDE-Q=Eating Disorder Examination Questionnaire

Table 5

Fully adjusted multivariate logistic regression model examining associations with obesity (defined as BMI ≥ 95th percentile)

Variable	Wald	Odds Ratio	95% Confidence Interval	*p*-value
Without EDE-Q: model $\chi^2(6)=39.01$, $p<0.001$, $R^2=0.129$				
Age (years)	1.30	1.15	0.91, 1.46	0.25
Peri-urban school location	9.65	2.41	1.38, 4.18	<0.01
Low relative material wealth	2.51	0.66	0.39, 1.11	0.11
Perceived feasibility of and desire for upward social mobility	9.67	1.68	1.21, 2.34	<0.01
Perceived Western/global cultural knowledge and competencies	0.84	1.13	0.87, 1.47	0.36
Breakfast skipping	7.75	1.18	1.05, 1.33	<0.01
With EDE-Q: model $\chi^2(7)=72.19$, $p<0.001$, $R^2=0.232$				
Age (years)	0.20	1.06	0.82, 1.37	0.65
Peri-urban school location	8.84	2.41	1.35, 4.29	<0.01
Low relative material wealth	1.36	0.72	0.41, 1.25	0.24
Perceived feasibility of and desire for upward social mobility	4.99	1.48	1.05, 2.10	0.03
Perceived Western/global cultural knowledge and competencies	0.27	1.08	0.82, 1.42	0.61
Breakfast skipping	1.57	1.09	0.96, 1.23	0.21
EDE-Q global score	30.03	2.06	1.59, 2.67	<0.001

Note. n=517, EDE-Q=Eating Disorder Examination Questionnaire