Are physical activity and breakfast skipping habit associated with stress among adolescents of Coimbatore, Tamil Nadu?

(A cross-sectional study)

Master of Public Health Integrated Experience Project

A Research Grant Proposal

By

Vijayalakshmi Nallaepilly Chellythody MD (candidate), MPH (candidate)

Advising Team,

Vahe Khachadourian MD, MPH, PhD (Candidate)

Julie A Gazmararian PhD, MPH

Gerald and Patricia Turpanjian School of Public Health

American University of Armenia

Yerevan, Armenia

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List of abbreviations

AMD: Armenian Dram

AYA-PSQI: Adolescent and Young Adult Pittsburgh Sleep Quality Index

DEFF: Design Effect

GSES: General Self-Efficacy Scale

INR: Indian Rupee

IPAQ: International Physical Activity Questionnaire

MET: Metabolic Equivalents of Task

OR: Odds Ratio

PSQI: Pittsburgh Sleep Quality Index

PSS: Perceived Stress Scale

RSES: Rosenberg Self-Esteem Scale

SPSS: Statistical Package for Social Sciences

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Executive summary

The estimated prevalence of stress ranges from 13% to 45%, among adolescents in India. There is a strong association between stress and mental health. Globally, 20% of children and adolescent suffer from disabling mental disorders, and 50% of the mental health issues among adult have been found to be rooted in the adolescent period. Suicide is one of the serious consequences of stress, while depression is an intermediate stage between them. Suicide is the third driving reason for death among students in India and globally, and it has gained huge importance in India. There are various sources and risk factors for adolescent stress. Schools, family, friends, and relatives are sources of stress, while factors such as sleep disorders, low self-esteem, high demands and low social support are risk factors for adolescent stress. Other factors associated with stress are number of siblings, socio-economic status of the family, parent quarrels, parent educational status, and gender. Physical activity is negatively associated with stress. The period between 12 years of age to 17 years of age was when the physical activity decreases among adolescents. Change in frequency of physical activity from least active to even moderately active or almost every day a week showed a significant decrease in stress scores as well as the negative impacts of stress on health. The association was relatively stronger among female adolescents when compared to their male counterparts. Skipping meals is a habit that increase with age. Breakfast frequency has a significant inverse relationship with mental distress among adolescents. The proposed study aims to estimate the prevalence of stress among the students from 9^{th} – 12^{th} grade and to examine the association between stress and physical activity, and between stress and breakfast skipping. The study will require a sample size of 582 to answer the research questions. The study instrument will include: Socio-demographic questions, Perceived Stress Scale, breakfast frequency question, International Physical Activity

Questionnaire, General Self-efficacy Scale, Rosenberg Self-esteem Scale, and Modified Pittsburg Sleep Quality Index. The data entry will be done in SPSS software and imported to STATA software for analysis. The analytical methods include descriptive analysis, bivariate analysis, and logistic regression analysis. The study has been approved by Institutional Review Board of Gerald and Patricia Turpanjian School of Public Health at the American University of Armenia. The total budget for the project will be 243,000Indian Rupees equivalent to 1,803,000 Armenian Drams. The study will provide the basis for future research in this field and can be used to plan interventions to improve the psychological health of adolescents.

1. Introduction

1.1 Prevalence of stress and its outcome among adolescents

Adolescents account for 20% of the world's population.[1] According to the Institute for Health Metrics and Evaluation, the prevalence rate of stress is growing among adolescents all over the world[2], and adolescents in India are not an exception. The adolescent group makes up 21% of the total population in India[3], of which a considerable proportion of adolescents experience stress. The estimated prevalence of stress ranges from 13% to 45%, among adolescents in India.[4–9]

Studies have found strong association between stress and mental health.[10] Cognitive functioning has been suggested to be an intermediate between stress and mental health.[10] A stress event can result in cognitive overload and affect decision making which in turn can result in poor mental health.[10] Any kind ofstress can increase the risk of mental illnesses.[10] Globally, 20% of children and adolescent suffer from disabling mental disorders, and 50% of the mental health issues among adult have been found to be rooted in the adolescent period.[11]

Suicide is one of the serious consequences of stress, while depression is an intermediate stage between them. Studies have consistently shown the association of stress with depression[12–16], suicidal ideation[13] as well as the actual risk of suicide.[17] Several studies have found a relatively stronger association between academic stressors and suicidal ideation in East Asian countries when compared to findings from studies conducted in other countries[15,18]. These findings could be attributable to high familial and cultural demand for academic excellence in East Asian countries.[15,18] High suicide rates among students may also be attributable to academic stress. More than one third (37.8%) of suicides in India has been among the age group

of below 30 years.[19] Suicide is the third driving reason for death among students in India[16] and globally[11], and it has gained huge importance in India.[19] Suicide among students poses an enormous emotional and socioeconomic burden on the Indian society.[19] As the adolescent group accounts for a huge fraction of the population, their health influences the development of the country. Moreover, adolescents are the future generation of leaders, workforce, and guardians of the nation and their health and professional growth can have significant implications on country's prospects.

1.2 Adolescence and stress associated disorders

Adolescent period is an intermediate period between the childhood and adulthood during which takes place several important changes such as the transition from dependence to independence; identity formation; physical, psychological and sexual development.[20] During this period of life, individuals are more prone to negative effects of stress on health that can not only lead to physical illnesses but also maladjustment at schools, and behavioral and mental disorders.[21] Chronic stress during adolescence is also a risk factor for several diseases of adulthood such as cardiovascular diseases, diabetes, and immune suppression.[22,23] Anxiety, depression, and burnouts are other manifestations of stress.[24]

1.3 Factors associated with adolescent stress

Risk factors for stress during adolescence

There are various sources and risk factors for adolescent stress. Schools, family, friends, and relatives are sources of stress[20], while factors such as sleep disorders[25,26], low self-esteem[26–29], high demands and low social support[26,30] are risk factors for adolescent stress. A Swedish study reported a dose-response relationship between risk factors and stress among adolescents.[30]

The students who experienced stress perceived lower levels of self-concepts such as self-esteem, self -efficacy, self -rated health.[30] In contrast, the no-stress group perceived higher levels of self-concepts .[30] Students reporting high-risk factors are at higher risk for progressing to chronic stress.[30]

Other factors associated with stress among adolescents are number of siblings, number of rooms at home (as a measure of family's socioeconomic status), parent quarrels, parent educational status, prior information on pubertal changes in adolescents and gender.[21]

Number of siblings

A study conducted by *Parpio et al*. in Pakistan reported that number of siblings has a dose-response relationship with the level of stress.[21] Students with more number of siblings are emotionally mature which makes them more sensitive to negative life events. Nonetheless, Pastey and Aminbhavi suggested that number of siblings is not associated with stress.[31] These studies showed controversial results on the relationship between number of siblings and perceived levels of stress. A study conducted by Alisa Daniel found that level of stress depends on the type of relationship between siblings (affection or conflict) rather than number of siblings.[32]

Socio-economic status of the family

Socio-economic status is inversely related to the level of stress.[21] A study conducted among 11- 13-year-old children from an urban population of Seattle observed a significant association between income of the family and depressive symptoms(as a proxy for stress).[33] Levels of depressive symptoms was reported to be higher among children from lowest income group when compared to middle and highest income group.[33] Children from low socioeconomic conditions are more prone to pessimism (the tendency to believe worst things will happen) which

can be a cause of stress among them.[34] Similarly, parental educational qualification has an influence on stress among adolescents.[35] Research shows lower levels of stress among students of parents with higher educational qualification.[35] The findings of these studies show that low socio-economic status of the family is a risk factor for stress.

Parental quarrel

Parents are the significant stakeholders in the lives of adolescents.[21] They pass on life skills and essential information to their children.[21] The level of stress among adolescents increases with a parental quarrel.[21,36]

Gender

Perceived levels of stress vary across gender. Females are prone to higher levels of stress when compared to males.[21] Moreover, physiological and physical changes of puberty can be stressful for females. Nevertheless, there is a difference in the levels of stress perceived among females, based on whether they are prepared for the physiological and physical changes of puberty.[21] The level of perceived stress was lower among female students who had been prepared for the changes through prior information in contrast to female students who did not have prior knowledge of pubertal changes.[21]

Academic and exam stress

Academic stress is common among adolescents.[30] Inability to understand the subjects and lack of interest in attending classes can result in academic stress.[37] Academic stress is higher among the students of East Asian countries which might be explained by the high self-expectations among students as well as their parents and teachers.[18] Academic excellence is often considered as the paths for "upward mobility and expanded options", therefore, children lose their family support when their academic performance decreases, which can eventually

result in stress.[18] A Similar situation is present in India. The pressure to achieve good grades, to meet the expectations of parents teachers and relatives are some of the causes for academic stress among adolescents which has the potential to affect the academic performance due to high perceived demands.[20,30,38] Kaplan et al. conducted a longitudinal study among students in which self-expectations was measured initially and after a follow up of three years the level of stress and academic performance were evaluated.[38] The results from this study showed that self-expectations become counter-productive in the presence of other stressful conditions which eventually can cause poor academic performance.[38]

A student's perceived levels of stress differ by the type of school. Husain et al. in a study conducted in Delhi, India observed a higher level of stress among those students studying at private schools when compared to those studying at the public schools.[21,37,39] The variation in academic workload and the school environment could partly explain the difference in magnitude of stress among students studying in public and private schools.[39]

1.4 Relationship between physical activity and stress

Physical activity is negatively associated with stress (Appendix-1).[40] Several studies have demonstrated that physical activity by increasing the resistance to stress[41,42] as well as by improving the negative effects of stress, can act as a buffer against stress.[40,43] Jose and Radcliffe in a study conducted in New Zealand found that stressful events increased between age of 12 to 17 years, especially among females.[44] The observed trends could be partly explained by the decrease in physical activity among adolescents between age of 12 and 17.[45]

Several studies document the relationship between physical activity and stress.[46,41,43,47] A systematic review conducted by Calfas and Taylor assessing the association between physical

activity and psychological variables reported a negative relationship between physical activity and anxiety and stress.[46] Moljord et al. in a study conducted among Norwegian students reported a significant inverse relationship between physical activity and stress.[41] Change in frequency of physical activity from least active (l day per week) to even moderately active (2-3 days per week) or highly active (almost every day a week) showed a significant decrease in stress scores[41] as well as its negative impacts on health.[43] Similarly, Tajik et al. found that symptoms of stress were associated with low levels of physical activity among students.[47] The study also demonstrated that perceived stress was lower among adolescents doing vigorous physical activity when compared to those doing moderate physical activity.[46] Students who perceived higher levels of physical activity were more likely to be socially active, suggesting the possible role of social activity as a mediator between physical activity and stress.[47]

Different types of physical activity (e.g. cardiovascular fitness and leisure time physical activity) can have variable effects on stress-related symptoms.[40] Cardiovascular fitness has been shown to have a significant negative association with stress-related symptoms only if health-complaints (e.g. depression) were used as outcomes.[40] However, leisure time physical activity at higher levels reduced symptoms of stress.[48] Individuals reporting high levels of cardiovascular fitness were more likely to engage in leisure time physical activity showing an association between cardiovascular fitness and leisure time physical activity[49].

The role of physical activity as a buffer against stress has explanations from two perspectives: physiological and psychological perspectives. A physiological rationalization is that diminished cardiovascular response to stress mediates the stress-buffer role of physical activity, which shows the importance of aerobics in combating stress.[50] However, a study conducted by Brown and Seigel did not observe any distinction between the effects of aerobic

and anaerobic exercises on reactivity to stress.[43] The psychological explanations for the buffering effects of physical activity are: increase in self-efficacy that follows regular physical activity which leads to the perception of life events less stressful when compared to those who do not indulge in regular physical activity, and it is additionally hypothesized that physical activity buffers stress by the shift of attention focus from the stressful events.[51]

1.5 Breakfast skipping and stress

Growth and development of adolescents primarily depend on the diet, which emphasizes the need for healthy eating practices during this crucial phase of life.[52] Skipping meals is a habit that increase with age.[35] A study conducted in Baroda, India, found that 40% of the adolescents in the study skipped their breakfast.[52] Similarly, a Malaysian study showed that 14.1% of the participants (adolescents) skipped one of the meals in a day and especially the breakfast.[35] About 44% of the participants missed at least one breakfast in a week.[35]

Gender and parental educational qualification are associated with breakfast skipping habit among students. Girls skip their breakfast more frequently than boys.[35,53] A study conducted in Norway reported a significant inverse association between breakfast frequency and mental distress among adolescents.[53] Students of parents with lower educational levels skipped breakfast more often. A study conducted by Lien showed that only 10% of children, whose parents were highly educated skipped breakfast, whereas, 38% of children, whose parents had lower education skipped their breakfast.[53] This association could be attributable to the less attention of the parents with lower education on the diet's quality.[35] Breakfast skipping and the school grades were associated (Adjusted OR = 2.0).[53] However, the association between breakfast skipping and school grades did not vary across gender.[53]

Breakfast skipping is also associated with increased levels of stress (Appendix-1). Previous studies show that breakfast skippers have three times higher perceived mental distress when compared to breakfast consumers.[53,54] A study conducted by Tajik et al. in Malaysia, observed that students with a breakfast frequency of once a weak were more likely to perceive stress when compared to those with a frequency of 4-7 days/week.[35] The study findings were consistent with the findings of the study conducted by Smith which suggested that perceived stress was lower among those who consumed cereal breakfast when compared to those who did not consume breakfast at all.[55]

The reason behind the association between breakfast skipping and stress is that nutrition is required for effective mental functioning. When breakfast is skipped, it results in a state of nutrition depletion.[35] Nutrition depletion can lead to lack of concentration and low problem-solving abilities which in turn can cause academic stress among adolescents.[35]

There is a gender difference in the association between stress and breakfast skipping.[53] Even though the frequency of breakfast skipping was higher among girls, boys had 3.0 times higher odds (Adjusted Odds Ratio, OR = 3.0) of developing mental distress when compared to girls (Adjusted OR=1.6).[53]

1.6Rationale

The studies on the association of physical activity and breakfast skipping habits with stress among adolescents have been conducted in several countries.[35,41,42,47] However, this issue has not been studied in India. The current proposal suggests conducting a study in India to estimate the prevalence of stress among the students from 9^{th} – 12^{th} grade and to examine the association between stress and physical activity, and between stress and breakfast skipping.

Results from such study would help the stakeholders (adolescents, parents, guardians, teachers, school authorities) in understanding the significance of physical activity and dietary habits in the maintenance of psychological health of adolescents. Physical activity and breakfast could be the focus for developing targeted interventions and schools can serve a major role in the interventions. This study could provide a basis for the development of strategies to improve the mental health of adolescents.

1.7Aim and research questions of the study

The aim of the proposed study is to estimate the prevalence of stress among the students from 9^{th} – 12^{th} grade and to examine the association between stress and physical activity, between breakfast stress and skipping. Specific research questions are:

1. What is the level of stress among students of 9^{th} – 12^{th} grade?
2. Is the habit of skipping breakfast associated with stress among 9^{th} – 12^{th}-grade students?
3. Is physical inactivity associated with stress among 9^{th} – 12^{th}-grade students?

2. Methods

2.1 Study design

The study will employ a cross-sectional survey design and will use a self-administered questionnaire to measure the levels of stress (outcome), physical activity and breakfast skipping habits (exposure), gender, grade, academic performance, socio-economic status, number of siblings, parental education, self-esteem, self-efficacy, and sleep disorders (covariates). This study design is being used given its efficiency regarding economic cost and time.

2.2 Study population and setting

The target population of the study will be adolescents of 9^{th} – 12^{th}-grade students living and studying in Coimbatore district, Tamil Nadu, India.

The inclusion criteria for the schools

1. Having higher secondary classes (9^{th}, 10^{th}, $11^{th}$and 12^{th} grade)
2. Schools following state board syllabus

The exclusion criterion for schools:

1. Schools that have languages other than English as the medium of instruction

The exclusion criteria for students

1. The students absent during the data collection session will be excluded from the study
2. Physically disabled students will be excluded from the study

The study setting will be the classrooms.

2.3 Sample size

The sample size is calculated for the second research question: "Is the habit of skipping breakfast associated with stress among 9^{th} – 12^{th}-grade students?", assuming the proportion of students with perceived stress in the breakfast skipping group to be 50% and a difference of 25% between the breakfast skipping and breakfast consuming groups was reported in a study conducted in Norway among adolescents.[53] To be more conservative a difference of 20% between the groups will be used for the sample size calculation.

The formula for sample size calculation is as follows:

$n\ 1 = n\ 2 = (Z_{\alpha/2}+Z_{\beta})^2 * (p_1\ (1-p_1)+ p_2\ (1-p_2)) / (p_1-p_2)^2$

Where $Z_{\alpha/2} = 1.96$, $Z_{\beta} = 0.84$, P1 = 0.5, P2 = 0.3.

$n\ 1 = n\ 2 = [(1.96+0.84)^2*\{(0.50*0.50) + (0.30*0.70)\}]/ (0.50-0.30)^2= 7.84*0.46/ 0.04$

$=3.59/ 0.04$

$= 90$

Number of students required in one group is 90. Therefore, the sample size for two groups N is 180.

As the prevalence of breakfast skippers is 40% and the two groups may be of unequal sizes, the sample size after adjusting for unequal sizes of group will be:

$N^*=\frac{N(1+k)^2}{4k} = \frac{180(1+0.67)^2}{4*0.67}= 502/2.68 = 188$

The expected size of the clusters will be 32, as each classroom may have an average of 40 students and under the assumption that the consent rate will be 80%.

Design effect, $DEFF = 1 + \delta\ (n - 1)$[56],

Where δ = intra-cluster correlation

n = size of the cluster

The intra-cluster correlation for psychological health among students ranges from 0.01-0.07[57]. A median value of 0.04 will be used for calculation of DEFF.

$DEFF = 1+ 0.04\ (32-1)$

= 1+1.24

= 2.24

Therefore, the effective sample size will be as follows:

n = Sample size * DEFF

= 188*2.24= 422

The anticipated response rate is 80%. The effective sample size after adjusting for non-response will be:

n = 422/0.8 = 528

There will be a total of 20 clusters in the study, 4 clusters from each school resulting in five schools. The five schools will be randomly selected from the list of eligible schools using the RANDBETWEEN command in Microsoft Excel. An additional list of randomly selected schools will be created to account for if any of the schools will refuse to participate in the study.

2.4 Sampling strategy

The sampling frame will be the list of schools in the Coimbatore district. The sampling method is multi-stage cluster sampling. The schools will be selected by simple random sampling method from the list of schools in the Coimbatore district. The sampling frame will be a list of eligible schools. Five schools will be selected by using RANDBETWEEN command in Microsoft Excel. From each grade levels, one class section (out of four sections) will be selected which will serve as a cluster, which will result in four clusters from each school. An additional list of randomly selected schools will be created to replace the schools that refuse to provide permission.

2.5 Study instrument

The study instrument (Appendix-2) will include the following sections:

1. A socio-demographic questionnaire will be developed to measure demographic characteristics of the students such as age, gender and grade, number of siblings, parental educational qualification, academic performance, and socio-economic status.
2. Perceived Stress Scale (PSS) will be used to measure the prevalence of stress among adolescents. PSS is a validated questionnaire that is most widely used to measure perception of stress[58] and consists of 10 questions.
3. A short form of International Physical Activity Questionnaire (IPAQ) will be used to measure the levels of physical activity among adolescents.[59] IPAQ consists of 7 open-ended questions.
4. Breakfast frequency will be measured using the question: "How often do you eat breakfast in an ordinary week including the weekdays and weekends?". The response options will be "seldom/never", "1-2 times per week", "3-4 times per week", "5-6 times per week" and "daily"[53]. This question was used in a study conducted in Norway to measure breakfast consumption among adolescents .[53]
5. The Rosenberg Self-Esteem Scale (RSES) will be used to measure the levels of self-esteem among adolescents. RSES is a most widely used scale which has high reliability and internal consistency and consists of 10 questions.[60]
6. General Self-efficacy Scale (GSES) will be used to measure self-efficacy among adolescents.[61] GSES consists of 10 items.[61]
7. The Pittsburgh Sleep Quality Index (PSQI) for adults will be modified for use in adolescents to measure the sleep quality. A modified version of PSQI was used for study

among Spanish adolescents which is the Adolescent and Young Adult Pittsburgh Sleep Quality Index (AYA-PSQI).[62] The question number 7 of the adult PSQI is "During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in the social activity?".[62] To use this scale among adolescents this question was modified as: "During the past month, how often have you had trouble staying awake while studying, eating meals, or engaging in social activity?".[62] The AYA-PSQI scale has good convergent and divergent validity as well as moderate reliability.[62] The scale consists of 9 items.

The questionnaire will be pretested for its appropriateness to the study population before the data collection process. The pretest will be conducted in a school that will not be included in the study. The pretest will be used to determine the duration of the survey, identify any potential mistakes in the questionnaire and questions. The anticipated duration of the survey will range from 20-30 minutes.

2.6 Variables and measures

The dependent variable (outcome) (Appendix-3):

1. Level of stress among 9^{th} – 12^{th}-grade students - The level of stress will be measured using the Perceived Stress Scale (PSS) as a dichotomous variable (stress/ no stress). The response options for each question range from 0 to 4, where "0"= Never, "1"= Almost never, "2"= Sometimes, "3"= Fairly often and "4"= Very often. The Individual PSS score will be obtained by addition of scores of all the items after reversal of responses for the items 4, 5, 7 and 8. In a study conducted in Pakistan, the author dichotomized the PSS scores into high and low levels of stress with a cut-off score of 28.[63] Therefore, the

cut-off score of 28 will be used to dichotomize the PSS scores into High and Low-stress levels. Students having a score ≥ 28 will be included in the stress group and those having a score < 28 will be included in the no stress group.

The independent variables (Exposures) (Appendix-3):

1) Skipping breakfast- A study conducted in Norway dichotomized the responses during analyses as "eating seldom" ≤ 2 times per week and "often" ≥ 3 times per week.[53] Therefore, breakfast skipping will be a dichotomous variable. Consumption of a cup of tea or a cookie will not be considered as breakfast.[54]
2) Level of physical activity among 9^{th} – 12^{th}grade students - The scale that will be used to measure the level of Physical Activity is using International Physical Activity Questionnaire (IPAQ). For data analysis, the values of 3.3 minutes per week (MET), 4 MET and 8 MET for walking, moderate and vigorous physical activity respectively was assigned. MET is defined as energy expenditure at rest.[64] The following formulas will be used for the calculation of METs for each type of activities:
   - ❖ Walking MET-minutes/week = 3.3 * walking minutes * walking days[65]
   - ❖ Moderate MET-minutes/week = 4.0 * moderate-intensity activity minutes * moderate days[65]
   - ❖ Vigorous MET-minutes/week = 8.0 * vigorous-intensity activity minutes * vigorous-intensity days[65]
   - ❖ Total physical activity MET-minutes/week = sum of Walking + Moderate + Vigorous MET-minutes/week scores[65]

   The following are the categories:

- ❖ Low level of physical activity- when the student doesn't meet the other two criteria (moderate or high level of physical activity)[65]
- ❖ Moderate level of physical activity- **a)** at least 20 minutes of vigorous physical activity for 3 or more days per week or **b)** at least 30 minutes of moderate intensity activity and/or walking for 5 or more days per week or **c)** a combination of walking, moderate intensity activity and vigorous activity that yields a total physical activity of 600 MET units for 5 or more days per week[65]
- ❖ High level of physical activity- **a)** vigorous activity on at least 3 days per week which yields a minimum total physical activity of 1300 MET units or **b)** a combination of walking, moderate intensity activity and vigorous activity that yields a total physical activity of 3000 MET units.[65]

Intervening variables (covariates) (Appendix-3):

1. Grade - 9^{th}, 10^{th}, 11^{th} and 12^{th},
2. Academic-performance will be self-reported, collected using the socio-demographic questionnaire (Appendix-3), which will be categorized as low≤59%, moderate 60-79% and high>80%,
3. Gender of the student will be a dichotomous variable (Male/Female),
4. Number of siblings will be a continuous variable,
5. Parental educational qualification will be measured as a categorical nominal variable which will be categorized as "≤8^{th} grade" = low, "9^{th} – 12^{th} grade" = moderate, "above 12^{th} grade" = high,

6. Socio-economic status will be self-reported, collected using the socio-demographic questionnaire (Appendix-3). It will be a categorical nominal variable which will be categorized as low, moderate and high,
7. Self-efficacy- The sum score of GSES ranges from 10-40. The responses are on Likert scale where, "Exactly True" = 4; "Moderately True" = 3; "Hardly True" = 2; "Not at all True" = 1. The author suggests having a median split (median score of the sample) to dichotomize the score into high or low self-efficacy.[66] The self-efficacy scores will be categorized into high, if scores ≥ median of the sample and low, if scores < median of the sample,
8. Self-esteem- The RSES scores ranges from 10 to 40. The responses are Likert type where "strongly agree"=4; "agree"=3; "disagree"=2; and "strongly disagree"=1. There is no widely accepted cut-off to categorize the level of self-esteem according to the RSES score. A study conducted among Finland adolescents suggests a cut-off of RSES score 25, to categorize the score into high self-esteem (RSES score ≥25) and low self-esteem (RSES score <25)[67] and having this as evidence the self-esteem score will be categorized into high and low levels of self-esteem, and
8. Sleep quality- The first 4 items of the scale are open-ended. The items from 5-8 have responses that are Likert type where "Not during the past month"=0; "less than once a week"=1; "once or twice a week"=2; "three or more times a week"=3. The 9th item also has a response in Likert scale where "very good"=0; "fairly good"=1; "fairly bad"=2; "very bad"=3. The first component of the scale is the score of the 9th item. The second component is the sum of scores of 2nd item (<15min (0), 16-30min (1), 31-60 min (2), >60min (3)) and item 5a which will be categorized according to the sum score as, 0="0";

1-2="1"; 3-4= "2"; 5-6= "3". The third component is the score of the 4th item which will be scored as, ">7 hours of sleep"=0, "6-7 hours of sleep"=1, "5-6 hours of sleep"= 2, "<5hours of sleep"= 3. The fourth component is actual hours of sleep and will be calculated as (total # of hours asleep) / (total # of hours in bed) x 100. It is categorized into the following scores: >85%=0, 75%-84%=1, 65%-74%=2, <65%=3. The fifth component is the sum scores of 5b-5j where the sores will be categorized as, "0"=0; "1-9"=1; "10-18"=2; "19-27"=3. The sixth component will be the score of the 6th item. The seventh component will be the sum score of the 7th and 8th item which will be categorized as, "0"=0; "1-2"=1; "3-4"=2; "5-6"=3. The sum of all the seven components will provide a global score. The score will be dichotomized as a score < 5 as good sleep quality and a score > 5 as poor sleep quality.

2.7 Data collection

Before data collection, parental consent forms (Appendix- 4) will be distributed by the teachers to the students of selected section of class, to acquire consent from the parents during class hours. The signed parental consent form will be submitted to the teachers by the students prior to the day of data collection. As an effort to increase the consent rate, the consent form will be distributed one week prior to data collection. The students will have one week time to return the consent form. The students who return the signed parental consent form will be included in the study.

Prior to data collection, the class teachers will be trained. The survey will be conducted during a class session. The survey will take 20-30 minutes to be completed. The students who do not have consent and students who do not want to participate besides the parental consent will be given a break during the data collection session. Students who have consent but do not

complete the survey will be excluded during the analysis. The class teacher will distribute the questionnaire to the students which will be collected after completion. The response rate is anticipated to be 80% as the consent forms will be collected by the class teachers[68].

2.8 Data entry and analysis

Data entry will be done in SPSS (Statistical Package for the Social Sciences) software. Double entry will be done for data verification, and data cleaning will be done by range checks. Data analysis will be performed in STATA after importing the dataset from SPSS. Descriptive analysis will be done for all the variables (stress and its levels, physical activity levels, breakfast skipping, academic performance, self-esteem, self-efficacy, parental education, socio-economic status, sleep quality and gender), which will be reported in means, frequencies and percentage. The bivariate analysis will be conducted between the dependent variable and all other variables used in the study. Those variables that will have significant association in the bivariate analysis with the dependent variable (p-value < 0.05) will be included in the further bivariate analysis to assess their association with the independent variable. All the variables associated with the dependent and independent variables (p-value < 0.05) will be considered as confounders in the final adjusted models. As the dependent variable (outcome variable = level of stress) is binary, logistic regression will be done to find a relationship between the independent of interest (exposure) and dependent variable (outcome). Two models will be used for analysis. Model 1 will be used for determining the association between breakfast skipping and levels of stress. The model will be adjusted for potential confounders that are significantly associated with the level of stress and breakfast skipping. Model 2 will be used for determining the association between levels of stress and levels of physical activity. Similar to model 1, model 2 will be controlled for covariates that are associated with the level of stress and physical activity.

2.9 Ethical considerations

International Review Board approval from the Gerald and Patricia Turpanjian School of Public Health at the American University of Armenia will be acquired before the data collection process. Permission from the school principals will be obtained for data collection after explaining the objective of the study. Written consent will be obtained from the parents of the students participating in the study prior to the data collection process. The consent form will state the objective of the study, duration of the study, risks and benefits from the study, and voluntary nature of the study. An oral assent (Appendix-5) will be obtained from the students during the data collection process. The assent will be read to the students before the data collection by the class teacher. Those students who agree to the oral assent form will be included in the study. The expected consent rate will be 80% as the data will be collected by the school staff.[68] Name of the students will not be collected to ensure anonymous nature of the study. Confidentiality of the data will be assured. The data collected from this study will not be used beyond the research purpose.

3. Budget

The budget was estimated based on the personnel costs and administrative costs (Appendix- 6). The research team will consist of project organizer, data collectors, data enterers and a statistician. The personnel cost will be the salaries for the research team members. The salary of the project organizer and the statistician will be on a monthly basis. As the data is collected in different sessions during the class, the data collector will be paid based on the number of sessions for data collection. The data enterers will be paid based on the number of questionnaires entered. The administrative costs will include the rent for the office, office supplies, transportation costs, communication costs, paper and printing costs. The total budget

for the project will be 405,750 Indian Rupees (INR), equivalent to 3,010,180 Armenian Drams (AMD) or $ 5,962. The budget for personnel costs totaled to 307,950INR, equivalent to 2,285,580AMD or $ 4,525. The budget calculated for administrative costs was 97,800 INR, equivalent to 724,600 AMD or $ 1,437.

4. Strengths and limitations of the study

Strengths:

This will be the first study to estimate the prevalence and association between breakfast skipping, physical activity and stress in the Coimbatore district. The use of standardized set of questionnaires and anonymous nature of the study (reduces social desirability bias) adds to the strengths of the study.

Limitations:

The sample population may not be representative of the adolescent population of Coimbatore district due to the use of cluster sampling technique. On the other hand, there can be a possibility for higher sampling errors due to this sampling technique. As the data will be self-reported, there can be a possibility for recall bias resulting in under or over-reporting. Another possible bias is non-response bias. The characteristics of participants and non-participants may not be similar. The data will not be collected from schools with the medium of instruction other than English. Therefore, the results cannot be generalized to the schools with the medium of instruction other than English.

5. Implications

The results of the study will provide a basis for future research purposes. The findings of the study will be used to plan and implement, innovative and appropriate interventions that can help improve the psychological health of the students, thereby preventing adverse effects of stress in adolescence in their adulthood.

References

1. United Nations / Department of Economic and Social Affairs. *World Population Prospects : The 2008 Revision*. Vol 87.; 2009. doi:21 February 2014
2. *The Global Burden of Disease Generating Evidence, Guiding Policy in Kenya*.; 2016. doi:10.1007/s13398-014-0173-7.2
3. Kumar V, Talwar R. Determinants of psychological stress and suicidal behavior in Indian adolescents: A literature review. *J Indian Assoc Child Adolesc Ment Heal*. 2014;10(1):47-68.
4. Bindu KN, Elizabeth KE. Prevalence of stress, anxiety and its correlates among adolescents in Kannur district, Kerala, India. *Int J Heal Sci Res*. 2016;6(August):225-228.
5. Mishra A, Sharma AK. A clinico-social study of psychiatric morbidity in 12 to 18 years school going girls in urban Delhi. *Indian J Community Med*. 2001;26(2):71-75.
6. Bansal V, Goyal S, Srivastava K. Study of prevalence of depression in adolescent students of a public school. *Ind Psychiatry J*. 2009;18(1):43-46. doi:10.4103/0972-6748.57859
7. Arun P, Chavan BS. Stress and suicidal ideas in adolescent students in Chandigarh. *Indian J Med Sci*. 2009;63(7):281-287. doi:10.4103/0019-5359.55112
8. Singh Chhabra G, Kaur Sodhi M. Factors contributing to psycho-social ill-health in male adolescents. *Online J Heal Allied Scs*. 2011;10(3):1-4.
9. Salunkhe V, Goel R, Jadhav P. Health status of adolescent in Navi Mumbai. *Int J Med Clin Res*. 2011;2(1):14-19.
10. Stead R, Shanahan MJ, Neufeld RWJ. "I'll go to therapy, eventually": Procrastination, stress and mental health. *Pers Individ Dif*. 2010;49(3):175-180. doi:10.1016/j.paid.2010.03.028
11. Belfer ML. Child and adolescent mental disorders: The magnitude of the problem across the globe. *J Child Psychol Psychiatry*. 2008;49(3):226-236. doi:10.1111/j.1469-7610.2007.01855.x
12. Deardorff J, Gonzales NA, Sandler IN. Control beliefs as a mediator of the relation between stress and depressive symptoms among inner-city adolescents. *J Abnorm Child Psychol*. 2003;31(2):205-217. doi:10.1023/A:1022582410183
13. Diaz A, Simantov E, Rickert VI. Effect of abuse on health: Results of a national survey. *Arch Pediatr Adolesc Med*. 2002;156(8):811-817.
14. van der Wal MF, de Wit CAM, Hirasing RA. Psychosocial health among young victims and offenders of direct and indirect bullying. *Radboud Repos*. 2003;111(6):1312-1317. doi:10.1063/1.3033202
15. Ang RP, Huan VS. Relationship between academic stress and suicidal ideation: Testing for depression as a mediator using multiple regression. *Child Psychiatry Hum Dev*. 2006;37(2):133-143. doi:10.1007/s10578-006-0023-8
16. Jayanthi P, ThirunavuKarasu M, Rajkumar R. Academic stress and depression among adolescents: A cross-sectional study. *Indian Pediatr*. 2015;52(3):217-219.

doi:10.1007/s13312-015-0609-y

17. Johnson JG, Cohen P, Gould MS, Kasen S, Brown J, Brook JS. Childhood adversities, interpersonal difficulties, and risk for suicide attempts during late adolescence and early adulthood. *Arch Gen Psychiatry*. 2002;59(8):741-749. doi:10.1001/archpsyc.59.8.741

18. Sue S, Okazaki S. Asian-American educational achievements: A phenomenon in search of an explanation. *Am Psychol*. 1990;45(8):913-920. doi:10.1037/0003-066X.45.8.913

19. Vijaykumar L. Suicide and its prevention: The urgent need in India. *Indian J Psychiatry*. 2007;49(2):81-84. doi:10.4103/0019-5545.33252

20. Simuforosa M. Stress and adolescent development. *Greener J Educ Res*. 2013;3(8):2276-7789.

21. Parpio Y, Farooq S, Gulzar S, Tharani A, Javed F, Ali TS. Factors associated with stress among adolescents in the city of Nawabshah, Pakistan. *J Pak Med Assoc*. 2012;62(11):1209-1213.

22. Johnston-Brooks CH, Lewis MA, Evans GW, Whalen CK. Chronic stress and illness in children: the role of allostatic load. *Psychosom Med*. 1998;60(5):597-603.

23. Low CA, Salomon K, Matthews KA. Chronic life stress, cardiovascular reactivity, and subclinical cardiovascular disease in adolescents. *Psychosom Med*. 2009;71(9):927-931. doi:10.1097/PSY.0b013e3181ba18ed

24. Suresh Prabu P. A study on academic stress among higher secondary students. *Int J Humanit Soc Sci Invent*. 2015;4(10):63-68.

25. Bernert RA, Merrill KA, Braithwaite SR, Van Orden KA, Joiner TE. Family life stress and insomnia symptoms in a prospective evaluation of young adults. *J Fam Psychol*. 2007;21(1):58-66. doi:10.1037/0893-3200.21.1.58

26. Schraml K, Perski A, Grossi G, Simonsson-Sarnecki Margareta M. Stress symptoms among adolescents: The role of subjective psychosocial conditions, lifestyle, and self-esteem. *J Adolesc*. 2011;34(5):987-996. doi:10.1016/j.adolescence.2010.11.010

27. Baumeister RF, Campbell JD, Krueger JI, Vohs KD. Does high self -esteem cause better performance, interpersonal success, happines or healthier lifestyle? *Psychol Sci Public Interes*. 2003;4(1):1-44.

28. Hallsten L, Josephson M, Torgén M. *Performance-Based Self Esteem*.; 2005.

29. Rector NA, Roger D. The stress buffering effects of self-esteem. *Pers Individ Dif*. 1997;23(5):799-808. doi:10.1016/S0191-8869(97)00095-0

30. Schraml K, Perski A, Grossi G, Makower I. Chronic stress and its consequences on subsequent academic achievement among adolescents. *J Educ Dev Psychol*. 2012;2(1):69-79. doi:10.5539/jedp.v2n1p69

31. Pastey GS, Aminbhavi VA. Impact of emotional maturity on stress and self confidence of adolescents. *J Indian Acad Appl Psychol*. 2006;32(1):69-75.

32. Danielle A, Langeveld C Van, Day R, Bean R. Sibling relationships, stress, and well-

being during early adolescence. *Brigham Young Univ*. 2010.

33. Annis DS, Mosher DF, Roberts DD. What explains the relation between family poverty and childhood depressive symptoms? *J Psychiatr Res*. 2009;27(4):339-351. doi:10.1016/j.neuron.2009.10.017.A

34. Finkelstein MD, Kubzansy DL, Capitman J, Goodman E. Socioeconomic differences in adolescent stress: The role of psychological resources. *J Adolesc Heal*. 2009;49(18):1841-1850. doi:10.1016/j.jacc.2007.01.076.White

35. Tajik E, Latiffah AL, Awang H, et al. Unhealthy diet practice and symptoms of stress and depression among adolescents in Pasir Gudang, Malaysia. *Obes Res Clin Pract*. 2016;10(2):114-123. doi:10.1016/j.orcp.2015.06.001

36. Kim KJ, Conger RD, Jr GHE, Lorenz FO. Reciprocal influences between stressful life events and adolescent internalizing and externalizing problems. *Child Dev*. 2017;74(1):127-143.

37. Ghatol SD. Academic stress among higher secondary school students: A review. *Int J Int J Adv Res Educ Technol*. 2017;38(1):38-41.

38. Kaplan D, Liu R, Kaplan H. School-related stress in early adolesence and academic performance three years later: The conditional influence of self-expectation. *Soc Psychol Educ*. 2005;8(1):3-17. doi:10.1007/s11218-004-3129-5

39. Husain A, Kumar A, Husain A. Academic stress and adjustment among high school students. *J Indian Acad*. 2008;34(April):70-73.

40. Gerber M, Lindwall M, Lindegård A, Börjesson M, Jonsdottir IH. Cardiorespiratory fitness protects against stress-related symptoms of burnout and depression. *Patient Educ Couns*. 2013;93(1):146-152. doi:10.1016/j.pec.2013.03.021

41. Moljord IEO, Eriksen L, Moksnes UK, Espnes GA. Stress and happiness among adolescents with varying frequency of physical activity. *Percept Mot Skills*. 2011;113(2):631-646. doi:10.2466/02.06.10.13.PMS.113.5.631-646

42. Nguyen-Michel ST, Unger JB, Hamilton J, Spruijt-Metz D. Associations between physical activity and perceived stress/hassles in college students. *Stress Heal*. 2006;22(3):179-188. doi:10.1002/smi.1094

43. Brown JD, Siegel JM. Exercise as a buffer of life stress: A prospective study of adolescent health. *Heal Psychol*. 1988;7(4):341-353. doi:10.1037/0278-6133.7.4.341

44. Jose PE, Ratcliffe V. Stressor frequency and perceived intensity as predictors of internalizing symptoms: Gender and age ifferences in adolescence. 2004:145-154.

45. Duncan PC, Duncan TE, Strycker LA, Chaumeton NR. A cohort-sequential latent growth model of physical activity from ages 12-17 years. *Ann Behav Med*. 2007;33(October 2015):80-89. doi:10.1207/s15324796abm3301

46. Calfas KJ, Taylor WC. Effects of physical activity on psychological variables in adolescents. *Pediatr Exerc Sci*. 1994;6(4):406-423. doi:10.1123/pes.6.4.406

47. Tajik E, Abd Latiff L, Adznam SN, Awang H, Yit Siew C, Abu Bakar AS. A study on

level of physical activity, depression, anxiety and stress symptoms among adolescents. *J Sports Med Phys Fitness*. 2017;57(10):1382-1387.

48. Sigfusdottir ID, Asgeirsdottir BB, Sigurdsson JF, Gudjonsson GH. Physical activity buffers the effects of family conflict on depressed mood: A study on adolescent girls and boys. *J Adolesc*. 2011;34(5):895-902. doi:10.1016/j.adolescence.2011.01.003

49. Wang C-Y, Haskell WL, Farrell SW, et al. Cardiorespiratory fitness levels among US adults 20-49 years of age: Findings from the 1999-2004 National health and nutrition examination survey. *Am J Epidemiol*. 2010;171(4):426-435. doi:10.1093/aje/kwp412

50. Hull EM, Young SH, Ziegler MG. Aerobic fitness affects cardiovascular and catecholamine responses to stressors. 1984:353-360.

51. Bahrke MS, Morgan WP. Anxiety reduction following exercise and meditation. *Cognit Ther Res*. 1978;2(4):323-333. doi:10.1007/BF01172650

52. Kotecha P V., Patel S V., Baxi RK, et al. Dietary pattern of schoolgoing adolescents in Urban Baroda, India. *J Heal Popul Nutr*. 2013;31(4):490-496.

53. Lien L. Is breakfast consumption related to mental distress and academic performance in adolescents? *Public Health Nutr*. 2007;10(4):422-428. doi:10.1017/S1368980007258550

54. Chaplin K, Smith AP. Breakfast and snacks: Associations with cognitive failures, minor injuries, accidents and stress. *Nutrients*. 2011;3(12):515-528. doi:10.3390/nu3050515

55. Smith AP. Breakfast and mental health. *Int J Food Sci Nutr*. 1998;49(5):397-402. doi:10.3109/09637489809089415

56. Rutterford C, Copas A, Eldridge S. Methods for sample size determination in cluster randomized trials. *Int J Epidemiol*. 2015;44(3):1051-1067. doi:10.1093/ije/dyv113

57. Shackleton N, Hale D, Bonell C, Viner RM. Intraclass correlation values for adolescent health outcomes in secondary schools in 21 European countries. *SSM - Popul Heal*. 2016;2:217-225. doi:10.1016/j.ssmph.2016.03.005

58. Cohen S. Perceived stress scale. *Psychology*. 1994:1-3. doi:10.1037/t02889-000

59. The IPAQ Group. International Physical Activity Questionnaire. *IPAQ Website*. 2015. doi:10.2165/11531930-000000000

60. Baumeister RF, Campbell JD, Krueger JI, et al. Mindfulness and self-esteem: A systematic review. *Pers Individ Dif*. 2013;35(2):213-240. doi:10.1007/s12671-015-0407-6

61. Schwarzer R, Jerusalem M. General self-efficacy scale. *Meas Heal Psychol A user's portfolio Causal Control beliefs*. 1995;(2008):35-37. doi:10.1037/t00393-000

62. de la Vega R, Tomé-Pires C, Solé E, et al. The Pittsburgh sleep quality index: Validity and factor structure in young people. *Psychol Assess*. 2015;27(4):e22-e27. doi:10.1037/pas0000128

63. Parpio Y. Prevalence and associated factors of perceived stress among adolescent ggirls in Nawabshah city , Pakistan. *J Ayub Med Coll Abbottabad*. 2013;25(1-2):116-119.

64. WHO | What is moderate-intensity and vigorous-intensity physical activity? *WHO*. 2014.

http://www.who.int/dietphysicalactivity/physical_activity_intensity/en/. Accessed January 5, 2018.

65. Ipaq. Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ) – short and long Forms. *Ipaq*. 2005;(November):1-15.

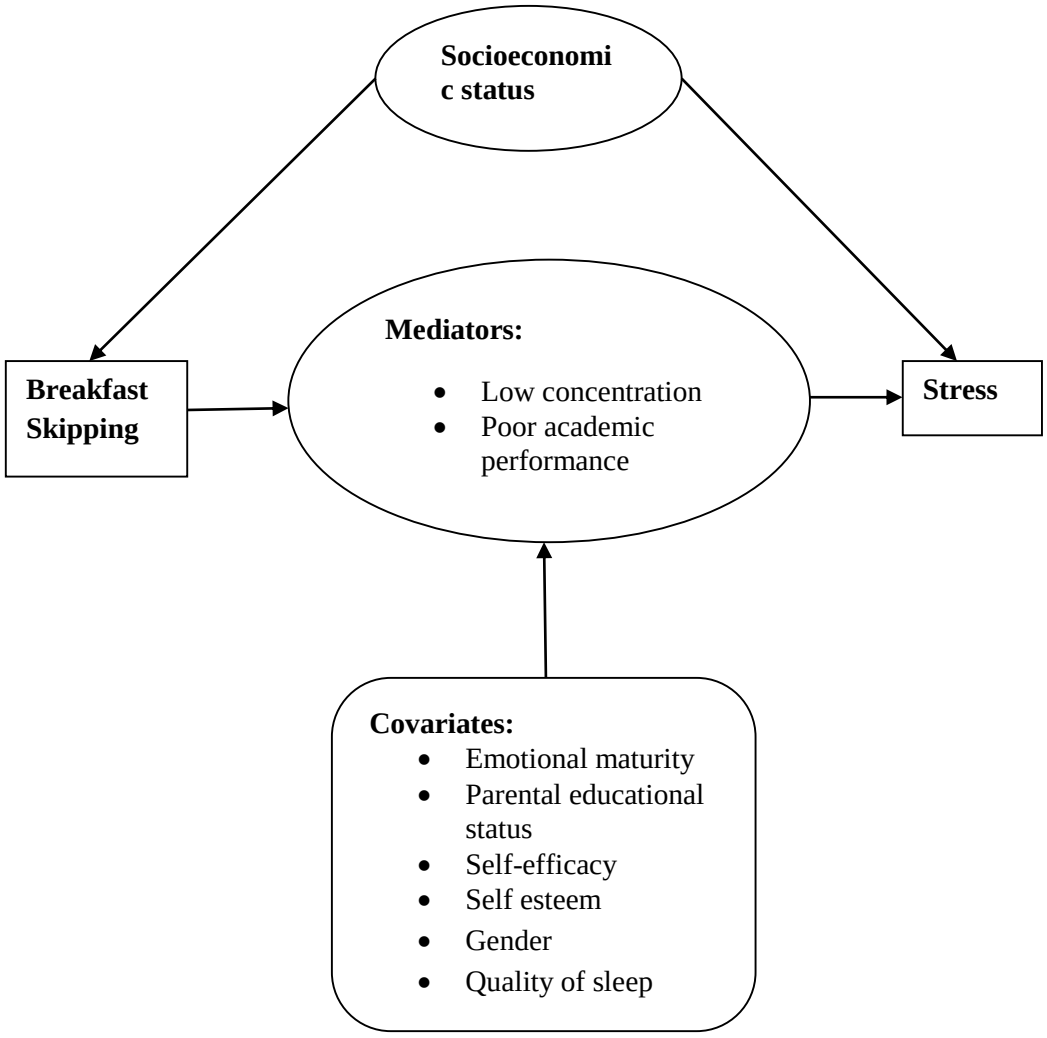
66. Schwarzer, R., & Jerusalem M. FAQ General Self-efficacy Scale. *Meas Heal Psychol A user's portfolio Causal Control beliefs*. 1995;(2008):35-37. doi:10.1037/t00393-000

67. Isomaa R, Väänänen JM, Fröjd S, Kaltiala-Heino R, Marttunen M. How low Is low? Low self-esteem as an indicator of internalizing psychopathology in adolescence. *Heal Educ Behav*. 2013;40(4):392-399. doi:10.1177/1090198112445481

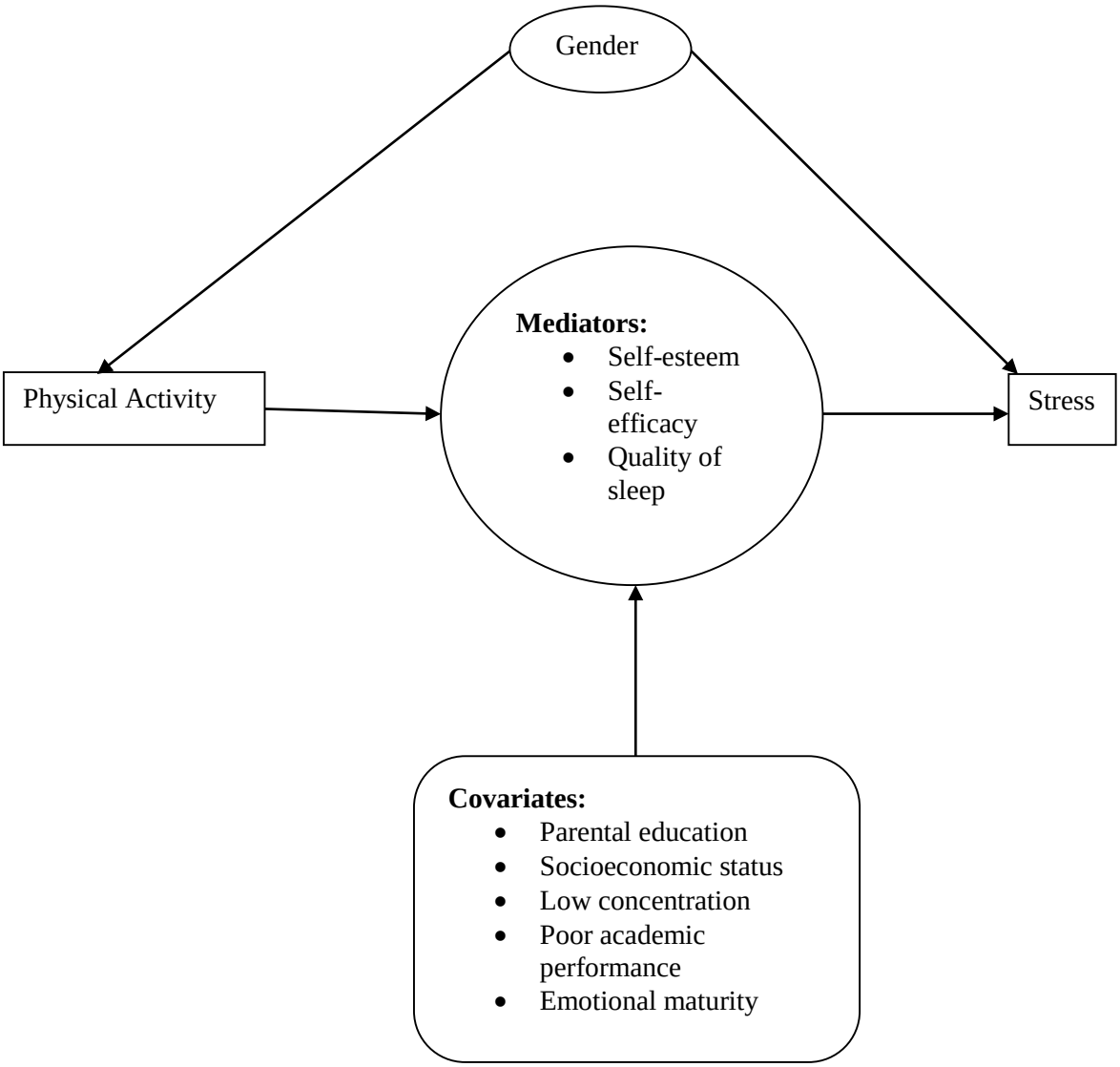
68. Rodgers P. Maximising the return of parent consent forms. *Am Found Suicide Prev (AFSP), Suicide Prev Resour Cent*. 2006;(February):1-5.

Appendix-1 Conceptual frameworks

A. Association between breakfast skipping and stress



B. Association between physical activity and stress



Appendix-2 Questionnaire

Are physical activity and breakfast skipping habits associated with stress among adolescents of Coimbatore, Tamil Nadu?

Interviewee ID: _____

Date of Interview: _____ (DD/MM/YYYY)

Part A: socio-demographic questions

The following questions ask about your demographic characters:

1. Class:
    1. ☐ 9^{th}
    2. ☐ 10^{th}
    3. ☐ 11^{th}
    4. ☐ 12th
2. Gender: 1. ☐ Male
    2. ☐ Female
3. Number of Siblings: _____
4. What is the highest level of education your father has obtained?
    1. ☐ No education
    2. ☐ Primary school (1^{st} to 5^{th} grade)
    3. ☐ Middle school ($6^{th}$to 8^{th} grade)
    4. ☐ Secondary school (9^{th} and 10^{th} grade)
    5. ☐ Higher secondary (11^{th} and 12^{th} grade)
    6. ☐ Undergraduate
    7. ☐ Post graduate
5. Mother's educational qualification:
    1. ☐ No education
    2. ☐ Primary school (1^{st} to 5^{th} grade)
    3. ☐ Middle school ($6^{th}$to 8^{th} grade)
    4. ☐ Secondary school (9^{th} and 10^{th} grade)
    5. ☐ Higher secondary (11^{th} and 12^{th} grade)

6. ☐Undergraduate
7. ☐Post graduate

6. How would you rate your family's general standard of living?
    1. ☐Substantially below average
    2. ☐Little below average
    3. ☐Average
    4. ☐Little above average
    5. ☐Substantially above average
7. What is your grade in the last term? (in percentage)_____

Part B: The Following questions ask about your physical activity ***during the past 7 days***.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

8. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ Days per week

1. ☐No vigorous physical activities ***Skip to question 10.***

9. How much time did you usually spend doing **vigorous** physical activities on one of those days?

_____ Hours and_____ Minutes per day

1. ☐Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

10. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **Days per week**

1. ☐No moderate physical activities ***Skip to question 12***

11. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **Hours per day**

_____ **Minutes per day**

1. ☐Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **Days per week**

1. ☐No walking ***Skip to question 14***

13. How much time did you usually spend **walking** on one of those days?

_____ **Hours per day**

_____ **Minutes per day**

1. ☐Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays (Monday to Friday) during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

14. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **Hours per day**

_____ **Minutes per day**

1. ☐Don't know/Not sure

Part C: The following question asks about what you eat at breakfast.

15. How often do you eat breakfast in an ordinary week (including weekdays and weekends)?

1. ☐Seldom/Never
2. ☐1-2 times per week
3. ☐3-4 times per week
4. ☐5-6 times per week
5. ☐Daily

Part D: Below is a list of statements dealing with your general feelings about yourself. Please indicate how true each statement is according to you.

		Not at all true	**Hardly true**	**Moderately true**	**Exactly true**
16	I can always manage to solve difficult problems if I try hard enough.	☐1	☐2	☐3	☐4
17.	If someone opposes me, I can find the means and ways to get what I want	☐1	☐2	☐3	☐4
18.	It is easy for me to stick to my aims and accomplish my goals.	☐1	☐2	☐3	☐4
19.	I am confident that I could deal efficiently with unexpected events.	☐1	☐2	☐3	☐4
20.	Thanks to my resourcefulness, I know how to handle unforeseen situations.	☐1	☐2	☐3	☐4

		Not at all true	Hardly true	Moderately true	Exactly true
21.	I can solve most problems if I invest the necessary effort.	☐1	☐2	☐3	☐4
22.	I can remain calm when facing difficulties because I can rely on my coping abilities.	☐1	☐2	☐3	☐4
23.	When I am confronted with a problem, I can usually find several solutions.	☐1	☐2	☐3	☐4
24.	If I am in trouble, I can usually think of a solution.	☐1	☐2	☐3	☐4
25.	I can usually handle whatever comes my way.	☐1	☐2	☐3	☐4

Part E: Below is a list of statements dealing with your general feelings about yourself. Please indicate how strongly you agree with each statement.

		Strongly Agree	Agree	Disagree	Strongly disagree
26.	On the whole, I am satisfied with myself.	☐4	☐3	☐2	☐1
27.	At times I think I am no good at all.	☐4	☐3	☐2	☐1
28.	I feel that I have a number of good qualities.	☐4	☐3	☐2	☐1
29.	I am able to do things as well as most other people.	☐4	☐3	☐2	☐1
30.	I feel I do not have much to be proud of.	☐4	☐3	☐2	☐1

		Strongly Agree	Agree	Disagree	Strongly disagree
31.	I certainly feel useless at times.	☐4	☐3	☐2	☐1
32.	I feel that I'm a person of worth, at least on an equal plane with others.	☐4	☐3	☐2	☐1
33.	I wish I could have more respect for myself.	☐4	☐3	☐2	☐1
34.	All in all, I am inclined to feel that I am a failure.	☐4	☐3	☐2	☐1
35.	I take a positive attitude toward myself.	☐4	☐3	☐2	☐1

Part F: The following questions relate to your usual sleep habits during the past week only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

36. When have you usually gone to bed? _____

37. How long (in minutes) has it taken you to fall asleep each night? _____

38. What time have you usually gotten up in the morning? _____

39. a) How many hours of actual sleep did you get at night? _____

b) How many hours were you in bed? _____

40	During the past month, how often have you had trouble sleeping because you	**Not during the past month (0)**	**Less than once a week (1)**	**Once or twice a week (2)**	**Three or more times a week (3)**
A	Cannot get to sleep within 30 minutes.	☐0	☐1	☐2	☐3
B	Wake-up in the middle of the night or early morning	☐0	☐1	☐2	☐3
C	Have to get up to use bathroom	☐0	☐1	☐2	☐3
D	Cannot breathe comfortably	☐0	☐1	☐2	☐3
E	Cough or snore loudly	☐0	☐1	☐2	☐3
F	Feel too cold	☐0	☐1	☐2	☐3
G	Feel too hot	☐0	☐1	☐2	☐3
H	Have bad dreams	☐0	☐1	☐2	☐3
I	Have pain	☐0	☐1	☐2	☐3
J	Other reason (s), please describe, including how often you have had trouble sleeping because of this reason (s)_____	☐0	☐1	☐2	☐3
41.	During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?	☐0	☐1	☐2	☐3
42.	During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	☐0	☐1	☐2	☐3
43.	During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?	☐0	☐1	☐2	☐3

44. During the past month, how would you rate your sleep quality overall?

1.☐ Very good

2.☐ Fairly good

3.☐ Fairly bad

4.☐ Very bad

Part G: The following questions ask you about your feelings and thoughts ***during the last month.*** In each case, you will be asked to indicate by ***marking a cross (X) on the boxes, how often*** you felt or thought a certain way.

		Never	**Almost Never**	**Sometimes**	**Fairly Often**	**Very Often**
45.	In the last month, how often have you been upset because of something that happened unexpectedly?	☐0	☐1	☐2	☐3	☐4
46.	In the last month, how often have you felt that you were unable to control the important things in your life?	☐0	☐1	☐2	☐3	☐4
47.	In the last month, how often have you felt nervous and "stressed"?	☐0	☐1	☐2	☐3	☐4
48.	In the last month, how often have you felt confident about your ability to handle your personal problems?	☐0	☐1	☐2	☐3	☐4

		Never	Almost Never	Sometimes	Fairly Often	Very Often
49.	In the last month, how often have you felt that things were going your way?	☐0	☐1	☐2	☐3	☐4
50.	In the last month, how often have you found that you could not cope with all the things that you had to do?	☐0	☐1	☐2	☐3	☐4
51.	In the last month, how often have you been able to control irritations in your life?	☐0	☐1	☐2	☐3	☐4
52.	In the last month, how often have you felt that you were on top of things (unpleasant)?	☐0	☐1	☐2	☐3	☐4
53.	In the last month, how often have you been angered because of things that were outside of your control?	☐0	☐1	☐2	☐3	☐4
54.	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	☐0	☐1	☐2	☐3	☐4

Appendix-3 Table of variables

Variable		Type	Measure	Source
Independent variables:	Breakfast skipping habit	Dichotomous	Consuming or skipping	Self-administered question[53]
	Level of physical activity	ordinal	High, Moderate, Low	Self-administered International Physical Activity Questionnaire[59]
Dependent variable:	Level of Perceived Stress	Dichotomous	Stress or No stress	Self-administered Perceived Stress Scale[58]
Covariates:	Grade	Nominal	9^{th}, 10^{th}, 11^{th}, 12^{th}	Self-administered question (Appendix-3)
	Gender	Dichotomous	Male, Female	Self-administered question (Appendix-3)
	Number of siblings	Continuous	numerical	Self-administered question (Appendix-3)
	Parental educational status	Ordinal	High, moderate, low	Self-administered question (Appendix-3)
	Socio-economic status	Ordinal	High, Medium, Low	Self-administered question (Appendix-3)
	Self-esteem	Dichotomous	High or Low	Self-administered Rosenberg Self-esteem Scale[60]
	Grade	Dichotomous	High or Low	Self-administered General Self-efficacy Scale[61]
	Sleep quality	Dichotomous	Poor or Good quality	Self-administered modified Pittsburg Sleep Quality Index Scale[62]
	Number of siblings	Ordinal	High, moderate, low	Self-administered question (Appendix-3)

Appendix-4 Parental consent form (Written consent)

American University of Armenia

Gerald and Patricia Turpanjian School of Public Health

International Review Board #1

Are Physical Activity and Breakfast skipping habit associated with Stress among Adolescents of Coimbatore, Tamil Nadu?

Hello, my name is Vijayalakshmi Nallaepilly Chellythody, a second year graduate student at Gerald and Patricia Turpanjian School of Public Health at the American University of Armenia as well as a final year medical student at Yerevan State Medical University. With the support from the Faculty of Gerald and Patricia Turpanjian School of Public Health, I am conducting a research to explore the association between Physical Activity as well as Breakfast Skipping Habits among adolescents of the age group 13- 17 years (9^{th}-12^{th} grade students) in Coimbatore, Tamil Nadu.

Your child is requested to participate in the study as our target population is school going adolescents aged 13-17 years (9^{th}-12^{th} grade students). Your child will be approached during the class time in the school with permission from the school authorities. Your child was selected randomly and will be one among 582 students participating in the study. Your child will not be contacted once the data has been collected.

Your child will be asked to complete a questionnaire that asks their feelings and thoughts during the last month, level of physical activity and breakfast consumption habits. The questionnaire would take about 20-30 minutes to be completed.

Your child's participation in this study poses minimal risk to your child. There is no direct benefit due to participation in the study, but your child's participation in the study could help better understanding of the relationship between physical activities, breakfast consumption habits with the psychological well-being of adolescents in Coimbatore, Tamil Nadu.

Your child's participation is important and the information provided by your child will be valuable. Your child's participation is voluntary and can skip any questions if he/she thinks is

inappropriate. Your child's name will not be collected during the survey in order to ensure anonymity. Only aggregated results of the study will be reported.

Your child can quit the study at any time and you or your child will not be penalized for refusing to participate in the study. If you or your child decides not to participate in the study, your decision will not affect your child's relationship with the school as well as your child's grade.

If you have any questions about the study, you can feel free to contact our principal investigator Dr. Vahe Khachadourian (vkhachadourian@aua.am, +1 8184332203). Regarding your child's Rights as a participant, please contact Varduhi Hayrumyan (vhayrumyan@aua.am, +374 60612617), Human Protection Administrator at American University of Armenia.

If you agree to let you child participate in the study, please sign the document.

If you do not agree, there is no need to sign the document.

I have read the form completely and I agree for my child's participation in the study described above.

Parent's Signature:

Date:

Appendix-5 Student assent form (Oral assent)
American University of Armenia

Gerald and Patricia Turpanjian School of Public Health

International Review Board #1

Are Physical Activity and Breakfast skipping habit associated with Stress among Adolescents of Coimbatore, Tamil Nadu?

Hello, my name is _____. I am talking on behalf of Vijayalakshmi Nallaepilly Chellythody, a second year graduate at Gerald and Patricia Turpanjian School of Public health at American University of Armenia as well as a final year medical student at Yerevan State Medical University. The department is conducting a study to explore the association between Physical Activity and Breakfast Skipping Habits with Stress among Adolescents of Coimbatore, Tamil Nadu. The study is being conducted among adolescents of 13-17 years age (9^{th}-12^{th} students), which is the reason why I am asking you to participate in this study.

The study includes a process of filling a questionnaire which questions you feeling and thoughts during the last month, your physical activity level and your breakfast consumption habit. The questionnaire will take about 20-30 minutes to be completed. The survey will be conducted in your classrooms. We appreciate your participation in the study. The information that you provide will be useful and valuable for the study.

Participation in this study poses minimal risk to you. The information that you provide will help better understanding of the association between physical activity, breakfast consumption habits and the psychological well-being of adolescents of Coimbatore, Tamil Nadu.

The survey will not collect any information that identifies you, such as Name, Telephone number or Address. Your responses will not be viewed by your Teachers, Parents or Friends. The information that you provide will be confidential.

Your participation is voluntary. You have the Rights to quit the survey at any time you wish or can skip any questions that you think is inappropriate to you. If you decide not to participate, your decision will not affect your grade. If you agree to participate, we can proceed further.

Appendix-6 Budget

Cost type	Unit cost	Number of units	Subtotal
Personnel costs:			
Project organizer	30,000(INR)/ 221,500 (AMD) per month	5 months	1,50,000 (INR)/ 1,107,500(AMD)
Data collectors	2,500 (INR)/ 19,000 (AMD) per session	20sessions	50,000(INR)/ 380,000(AMD)
Data enterer	15 (INR)/ 110 (AMD) per form	528 forms	7,950(INR)/ 58,080(AMD)
Statistician	20,000 (INR)/ 148,000 (AMD)per month	5 months	1,00,000(INR)/ 740,000(AMD)
Administrative costs:			
Office rent	10,000(INR)/ 74,000 (AMD) per month	5 months	50,000(INR)/ 370,000(AMD)
Office supplies	5,000(INR)/ 37,000(AMD) per month	5 months	25,000(INR)/ 185,000(AMD)
Utility costs	3,500(INR)/26,000 (AMD) per month	5 months	17,500(INR)/ 130,000(AMD)
Questionnaire printing	10 (INR)/75 (AMD)per form	528 forms	5,300(INR)/ 39,600(AMD)
		Total	405,750,(INR)/ 3,010,180(AMD)

Appendix-7 Timeline

	1st month				2nd month				3rd month				4th Month				5th month	
	1w	2w	3w	4w	1w	2w	3w	4w	1w	2w	3w	4w	1w	2w	3w	4w	1w	2w
Training of data collectors	*	*																
Pre testing the questionnaire			*															
Finalizing protocols and questionnaire				*														
Printing of the questionnaire				*														
Obtaining Consent					*	*	*	*	*									
Data collection						*	*	*	*	*								
Data enterer training								*	*									
Data entry and cleaning									*	*	*							
Data analysis												*	*	*	*			
Preparation of report															*	*	*	*