Household food insecurity, family size and their interactions for depression prevalence among teenage pregnant girls in Ghana, a multi-stage cluster sampling survey.

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Abstract

Background: Household-food-insecurity, is situation where individuals and families have limited/uncertain access to nutritionally-adequate and safe foods for healthy-living. Family is basic social-unit comprising parents and children living together in household. Household-food insecurity and family-size are risk factors for depression. However, their synergistic and/or multiplicative effect on depression are not well established. This study explored household-food insecurity, family-size and their interaction on depression prevalence among teenaged pregnant girls in Twifo-Attimorkwa district.

Methods: WHO-STEPS multi-stage clustered-random sampling-survey was used to recruit study participants. 20-electoral areas in Twifo-Attimorkwa district were randomly selected, and structured-questionnaire used to collect demographic-variables. Household-Food-Insecurity Access-Scale (HFIAS) and Child-Anxiety and Depression-Scale (RCADS-25) were used to collect data.

Results: Diastolic blood pressure (P-value=0.014) and household-food insecurity (P-value= 0.0001) were significant for depression. Moderate-family-size AOR=1.08, 95%CI (1.17-3.71) and large-family-size AOR2.78, 95%CI (3.98-10.19) were significant for depression. Moderate-food insecurity AOR= 0.12, 95%CI (0.41-0.35) and high-food insecurity AOR= 0.27, 95%CI (0.11-0.71) were significant for depression. Interaction between moderate-food insecurity and moderate family-size AOR=1.69, 95%CI (2.79-17.51), interaction between high-food insecurity and low family-size AOR=1.24, 95%CI (1.57-11.41) and finally, interaction between high-food insecurity and large-family-size AOR=1.01, 95%CI (1.72-14.57) were significant for depression among teenaged pregnant girls.

Conclusion: There is depression prevalence among populace in Twifo-Attimorkwa district. Teenaged pregnant girls report moderate and high depression prevalence. Household-food insecurity, and family-size are risk factors influencing depression among teenaged girls in the district. We recommend the need for population-based public health interventions in Twifo-Attimorkwa district, targeting teenaged pregnant girls.

Introduction

Food security is the measure of food availability, and individuals’ ability to access it [1]. According to the United Nations’ Committee on World Food Security, food security is defined as the ability of all people, at all times, to have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for active and healthy life [2]. This definition of food security incorporates a measure of resilience to future disruption or unavailability of critical food supply due to various risk factors including climate change, economic instability and wars. Individuals who are food secure do not live in hunger and/or fear of starvation. On the other hand food insecurity, is a situation where people have limited or uncertain availability of nutritionally adequate and safe food or limited or uncertain ability to acquire acceptable food in socially acceptable manner [3, 4]. A person is food insecure when s/he lacks regular access to enough, safe and nutritious food for normal growth and development, and active and healthy life[4]. Food insecurity can be experienced at different levels of severity, and when a person is severely food insecure, s/he has run out of food and gone a day or more without eating. In other words, this person has experienced hunger[5]. Moderate food insecurity is where access to food is uncertain, and people in moderate food insecurity might have to sacrifice other basic needs, just to be able to eat, and when they do eat, it might be whatever food that is most readily available, and/or cheapest, which might not be the most nutritious[5]. Low food insecurity is where individuals report little or no indication of reduced food intakes; or they report no reduced quantity, quality, variety, and/or desirability of diet[5].
Globally about 1.9 billion people experienced food insecurity in 2017, with the greatest numbers in Sub-Saharan Africa and South Asia [6]. About 9% of the world population i.e., 697 million people experience severe food insecurity [6]. The number of people unable to afford dissent or healthy diet around the world rose from 112 million in 2019 to almost 3.1 billion in 2020[7]. In 2021, nearly 924 million people (11.7 percent of the global population) faced food insecurity at severe levels[7]. Currently about 2.3 billion people in the world (29.3 percent) face moderate or severe food insecurity [7]. In Sub-Saharan Africa, about 30 percent of the population experienced severe food insecurity in 2020[8]. Around 37 percent of the region's population experienced food insecurity at moderate level, and close to 724 million people in south of Sahara experienced severe or moderate food insecurity [8]. In Ghana the prevalence of food insecurity is not different, it is reported that about 38.2 percent of Ghanaians experienced food insecurity [9].

Study shows that the major determinants of individuals vulnerability to food insecurity consist of clusters of risk factors that include demographic factors such as age of household head, family size, safety net programs, distance from healthcare facility and death of household members[10]. Central to these cluster of risk factors in the Ghanaian setting is the family. Families in Ghana play integral roles in individuals health seeking behaviors, decision making and resources allocation processes. Therefore, disrupting the family system in any form in Ghana could be counterproductive to individuals’ health in Ghana. In this regard it is important that researchers consider the concept of family and family size as major risk factors in the cluster of risk factors that can influence individuals’ vulnerability to adverse outcomes.

The word "Family" originated from the Latin word "familia," which means a group of people related either by consanguinity (birth) or affinity (marriage and other relationship)[11]. This definition, broadly count people as “family” even though they do not live together, but are related to one another biologically or through legal contracts. In contrast to this definition, other scholars defined family as a group of people not generally related to one another by blood, but share common attitudes, interests, or goals, and frequently live together[12]. In a more concise definition, family is a basic social unit comprising the parents and their dependent children living together in one household[13]. According to the most functional definitions of family, a family is any unit in which there exists: A sharing of resources and economic property, caring and supportive relationship, commitment to and/or identification with other members [14]. It is quite difficult to get or identify one universally acceptable definition of “family” that fit all, however, most definitions convey societally accepted beliefs about what is “normal” and “acceptable” and thus, by implication, what is “deviant” and/or socially sanctioned. Historically and in modern times, human societies use family as the primary locus of attachment, nurturance, and socialization[15-17] of which family size is of essence. Family size by definition is the number of persons in the family [18].

There are two main types of family sizes: large family size, and small family size. Large family size is the type where the number of members inside is large and thus, consist of the husband, wife, or wives, children, grandparents, uncles, aunts, cousins, nephews, nieces etc. Large family sizes, are often associated with extended family system[19]. This kind of family size most often produced consequences such as child labor, child abuse, child exploitation, neglect, drug peddling, and drop out of school leading to decline in moral and social standard[20]. Small family size on the other hand is the type of family that has fewer number of individuals, and traditionally refers to as the nuclear family system. This kind of family size consists of the husband, wife, or wives and children. Small family size allows for better planning and management in terms of feeding, clothing, shelter, education, saving for the future, promoting good moral values and standards, and give the family the ability to have intimate relationship.

Assessing the definitions of food security and family size thereof, it is clear that these variables in their adverse forms could have high propensity of causing psychological and mental disabilities including depression at varying degree among individuals. In a large-scale family policy and food insecurity observational analysis in 142 countries, Aaron R. et al., reported that moderate or severe food insecurity is higher in households with large family size[21]. However, in a
separate study conducted by Julia A.W. et, al., food insecurity was shown to be associated with depression, anxiety, and stress in the early days of the COVID-19 Pandemic [22]. Di Fang et al., also noted that food insecurity is associated with 257% higher risk of anxiety (odds ratio: 3.57; 95% CI: 3.01 to 4.23) and 253% higher risk of depression (odds ratio: 3.53; 95% CI: 2.99 to 4.17)[23]. In South Africa another study conducted indicates that food insecurity and depressive symptomology increased during the COVID pandemic, with both men and women significantly reported rising depressive symptoms with different levels of food insecurity[24]. Several other studies have shown the association of food insecurity with anxiety and depressive symptoms, with significantly increasing trend globally[25-27].

In related development family size has also been shown to be associated with depressive symptom. Study conducted by Alexandros G. et al., shown that having three or more children in a family was associated with higher odds of lifetime depression[28]. In a different study, being in a polygamous family (OR = 5.78, 95% CI, 3.253 - 24.371), and having a single parent (OR = 2.236, 95% CI, 0.869 - 11.786) were significantly associated with increased odds for depression among adolescents girls[29], and yet another study indicates that marital satisfaction, and harmony with mother-in-law in family prevented adolescent girls from depression[30].

Although different studies have demonstrated significant associations between household food insecurity, and family size for depression among people in different countries, very little of such studies have been conducted in Ghana. Also, very little is done to show how these variables (household food insecurity and family size) can interact synergistically or multiplicatively to influence depression among individuals. Individuals’ vulnerability to depression and other psychiatric symptoms depends on cluster of risk factors that can exist in tandem. Since these cluster of risk factors can exist together or in tandem to influence different outcomes, it is very important that researchers examine and ascertain how these risk factors can independently, synergistically or multiplicatively act to influence depression and other psychiatric symptomatology in order to design health promotion interventions to counter these pathways. In this regard, our study seeks to assess how household food insecurity, family size and their interactions are related to depression prevalence among teenage pregnant girls in Ghana.

**Methodology**

**Study population**

The aim of our study is to assess how household food insecurity, family size, and how the interaction between household food insecurity and family size are related to depression among teenage pregnant girls at Twifo Atti-Morkwa district in the central region of Ghana. To achieve this objective, single population proportion formula ($n= (Z^2 \times P(1-P))/e^2$) was used to estimate the sample size of our study. In the stated formular, the letter ‘n’ denotes study sample size, ‘Z’ denotes the population standard normal distribution of 1.96 for 95% confidence interval, ‘P’ is the true population proportion or prevalence of depression among teenaged girls in the study area thus, Twifo Atti-Morkwa district, and ‘e’ is the standard error of (5%). Since we could not find any previous study in Twifo Atti-Morkwa district that reported prevalence of depression among teenaged girls, we used the national child depression prevalence rate of 13% in calculating our sample size[31]. Thus, substituting these values in the equation, the sample size $n$ was calculated as $n=173$. However, for the fear of non-response from participants’ and registration error by data collectors, a contingency sample of 30% was added to the estimated sample. The final sample was therefore increased to 225.

**Sampling procedure**

We used WHO stepwise survey to include 200 teenaged pregnant girls in this study. The prevalence of household food insecurity and depression were therefore estimated from this sub-group survey participants. Twifo Atti-Morkwa district has 28 electoral areas. In the WHO STEPS survey, we employed multi-stage, clustered random sampling method, using
the 2020 Ghana population and housing census data (61,743) of the area as the base line. We used three-staged
geographically clustered random sampling method to recruit our study participants. In the first stage, out of the 28
electoral areas, we used simple random sampling to choose 20 electoral areas. In the second stage, each selected
electoral area is then zoned into four and simple random sampling applied to select three zones. From each selected
zone, houses and households were chosen to enter using systematic random sampling. Inside each house and in each
household, where an adolescence pregnant girl is found, her consent is sought and interview granted, otherwise the
process is repeated until an eligible participant is found and interviewed. These sampling processes were repeated in all
the 20 selected electoral areas until we recruited and interviewed our sample size of 200 participants. This data
collection process span through a period of 4 months (May to August, 2022)

Data collection procedure

We used structured questionnaire to collect participant demographic characteristics thus, age, marital status, place of
residence, educational background, parental occupation, family size smoking, and alcohol intake status. Household
Food Insecurity Access Scale (HFIAS) developed by Food and Nutrition Technical Assistance (FANTA) Program of the
U.S. Agency for International Development describes into details elsewhere[32], was used to measure participants
household insecurity. Furthermore, Child Anxiety and Depression Scale (RCADS-25)[33] also describes in details
elsewhere was used to assess the prevalence of depression among teenaged pregnant girls in our study. The
questionnaire used in this study were pre-tested among 20 individuals before the main data collection.

Statistical Analysis

IBM SPSS version 20 (SPSS, Chicago, IL, USA) was used to analyze the data. Data normal distributions checks were
done with Kolmogorov-Smirnov test. Descriptive statistics were used to describe participants’ demographic
characteristics, One-way ANOVA with Post Hoc Bonferroni correction tests was used to compare significant mean
differences across the three groups (low, moderate and high) of our dependent variable thus depression. The
assumption for using the One-way ANOVA test in our study is that our data came from independent random sample that
is normally distributed with homogeneous variance. Finally, we used multinomial logistic regression models to assess
the association of household food insecurity, family size and their interactions for depression prevalence among the
teenage pregnant girls in our study. The assumption for using the multinomial logistic regression models in our study
are that 1) our dataset has the outcome or dependent variable (depression) at three levels (low, moderate and high); 2)
the relationship between the logit (log-odds) of the outcome variable and each continuous independent variable is
linear; 3) there are no highly influential outlier data points in our data set that could distort the outcome and accuracy of
the model; 4) There are no highly correlated independent variables (multicollinearity) in our data that could reduce the
precision of the estimated coefficients, and weakens the statistical power of the logistic regression model; 5) The
observations in our dependent variables are independent of each other and are not coming from repeated or paired data;
6) our sample size is sufficiently large enough for adequate number of observations for each independent variable in
the dataset to avoid creating an overfit model. Our data set at hand meet all these assumptions, and this therefore,
informed our decision of using the multinomial logistic regression models to analyze our data. The statistically
significant of all the variables in our data was set at 0.050 alpha levels.

Results

Participants’ demographic characteristics are presented in table 1. About 43% of the study participants aged between
10-16 years, close to 58% aged between 17-20 years, and about 2% was married. With regard to education, close to 46%
have junior high school education, 32% have senior high, and the rest have other form of education. The prevalence of
moderate and high household food insecurity is 35.1 and 38.4; and that for depression is 35.1 and 33.5 respectively
table 2. There were significant mean differences in diastolic blood pressure (P = 0.014) and household food insecurity (P = 0.0001) with levels of depression among teenaged pregnant girls table 3.

The relation of household food insecurity, family size and their interaction for depression among teenage pregnant girls in Twifo Atti-Morkwa district is presented in table 4. After adjusting for confounding variables (educational level, parental occupation). Moderate food insecurity Adjusted Odd Ratio (AOR) 0.12, 95% Confidence Interval (95%CI) (0.41-0.35), and high food insecurity AOR= 0.27, 95%CI (0.11-0.71) were significant for depression. Moderate family size AOR=1.08, 95%CI (1.17-3.71) and large family size AOR=2.78, 95%CI (3.98-10.19) were significant for depression. The interaction between moderate food insecurity and moderate family size AOR=1.69, 95%CI (2.79-17.51) and the interaction between high food insecurity and low family size AOR=1.24, 95%CI (1.57-11.41) were significant for depression. Finally, interaction between high food insecurity and large family size AOR=1.01, 95%CI (1.72-14.57) was significant for depression among teenaged pregnant girls.

**Discussion**

In Twifo Attimorkwa district, prevalence of depression is present among the populace. Teenaged pregnant girls reported moderate and high depression prevalence in the district. The cluster of risk factors associated with depression prevalence among teenaged pregnant girls in the district are prevalence of household food insecurity, and family size. In Ghana prevalence of depression have been reported among people in different sub-population in several studies[34-37]. However, little evidence exists to show how different clusters of risk factors could interact synergistically or multiplicatively to influence depression, thus, our study therefore seeks to breach this gap.

In our study we found that moderate and large family sizes were related to depression prevalence among teenaged pregnant girls. This observation could be true because people living in large families may lack access to basic amenities including health care, cloths, shelter, and food. These lacks may produce stresses that could consequently produce early symptomatology of depression. As the teenaged girls struggle with coping, rumination and self-blame as a result of the stresses they received from life events, when not identified and managed timely, they may slip into overt depression. These findings are supported by Adewuya, A.O. et al. In their study the authors reported that large family size was associated with higher odds of depression[38]. Study in South African among pregnant women living in low socio-economic setting also supported our findings. Result from that study found that pregnant women living in food insecure homes with three or more children have increased odds of suicidal behaviour and depression[39].

We found that moderate and high food insecurity was related to depression prevalence among teenaged pregnant girls. This finding too could possibly be true because study show that presence of food insecurity is associated with mental ill-health, especially anxiety and depression among women[40]. Women who experience food insecurity feel uncertain as to whether food supplies will consistently be accessible in the present and/or in the future, and this generates stress which consequently trigger anxiety and depression.

In our study we found that interaction between household food insecurity and family size was related to depression among adolescent/teenaged pregnant girls. When household food insecurity prevalence interacts with family size, we realized that adolescent/teenaged pregnant girls presented more stronger odds of depression. These findings could also be true because both variables (household food insecurity and family size) are counterproductive to depression. When teenaged girls/pregnant girls live in large families with food insecurity, they share the problem and the different coping strategies their families go through to adapt. However, since these teenaged girls are not physically and mentally matured to become pregnant, but the uneventful happened (teenaged pregnancy), society viewed it as socially undesirable or unacceptable, and this alone is a risk factor for depression among these teenaged pregnant girls. So,
when household food insecurity and large family size interact and add up to this, the situation worsened, and thus push
the teenaged girl into more pronounced or overt depression.

On the other hand, at the molecular level, research show that hormones and chemical responsible for depression
include serotonin, dopamine, noradrenaline, and γ-aminobutyric acid (GABA) [41].

Adolescent girls living in large families most often suffer from three key components of food insecurity: -inadequate
access to food, inadequate supply of food, and inappropriate utilization of food (e.g., inappropriate preparation of food)
[42]. Per the explanation of food insecurity, people in moderate food insecurity might have to sacrifice other basic needs
just as to be able to eat, and when they do eat, it might be whatever food that is readily available, which might not be
nutritious. Adolescent girls in particular, who are exposed to food insecurity, often resort to meals skipping, and have
strong desires for sweet as part of their coping mechanism or strategies which are not nutritionally healthy. When
teenaged girls adopt to these poor eating habits and dietary patterns due food insecurity over time, they developed
many micronutrients deficiencies including essential amino acids such as tryptophan, tyrosine, phenylalanine, and
methionine that are helpful in the production of the neurotransmitters; serotonin, dopamine, noradrenaline, and γ-
aminobutyric acid (GABA) essential for depression [43]. To this extent we can all see how household food insecurity
could cause hormonal imbalance leading to ill health among people.

Although we found positive associations between household food insecurity, family size and depression in our study,
similar studies conducted elsewhere have shown much more positive association. For instance, Oderinde K., et al., in
their study reported that living in a polygamous family could result in as much as 478% odd of depression[24], while our
study reported just 178% odd. This difference in magnitude of the two results could probably occurred due to
differences in sampling procedure. While our study used multi-stage geographically clustered sampling method,
Oderinde K., et al., used simple random sampling. The other reasons that could account for these differences could be
due to differences in the sample population and sample size. In our study we sampled 200 teenaged pregnant
adolescent girls’ while Oderinde K., et al., sampled 540 in-school adolescents. Despite the differences in magnitude of
our results, both studies concluded that household food insecurity and family size are strong determinants for
depression among people.

Strength

We conducted our study using a representative sample of adolescent girls in Twifo Attimorkwa district by following
standard guidelines (WHO STEPS methodology) as prescribed by WHO in our population-based depression prevalence
and risk factors assessment. This increases the generalizability of our study findings.

Limitations

Despite this strength, our study equally suffered certain limitations. Firstly, the individual risk factor assessment
(household food insecurity) was assessed based on participants’ ability to recall, which could carry a certain degree of
recall bias. There could also be an underestimation of some behavioral risk factors such as tobacco intake and alcohol
consumption, due to socially desirable responses that tend to occur in interview-based surveys, also during pregnancy
there are hormonal changes that could affect mood of pregnant women, this phenomenon could also lead to under or
over estimation of our outcome variable (depression prevalence). However, the use of standard questionnaire, and
trained investigators in the data collection techniques have helped us minimized some of these biases especially the
recall and social desirability biases.

Conclusion
In Twifo Attimorkwa district, prevalence of depression is present among the populace. Teenaged pregnant girls report moderate and high depression prevalence. The cluster of risk factors shown to be associated with the depression prevalence among teenaged pregnant girls in the district are prevalence of household food insecurity, and family size. We therefore highlight the need for urgent population-based health promotion interventions in Twifo Atti-morkwa district, targeting the highly prevalent cluster of risk factors, especially among teenaged pregnant girls in the district.

Declarations

Ethical Approval and Consent to participate

This study protocol was approved by the Ghana Health Service Ethics Review Committee (GHS-ERC008/07/22). Adults’ participants who had formal education or those who could read and write, informed consent was sought from each one of them directly before they participated in the study. Those participants who did not have formal education and could not read and write, interpreters were contacted for read and interpreted the inform consent to these participants for them to understand and thumb printed on the inform consent form before participating in the study. Participants who were below 16 years informed consent was sought from their parents or legal guardians before they participated in our study. We confirm that all methods in this study were carried out in accordance with the relevant guidelines and regulations.

Consent for Publication

Not Applicable

Availability of data and materials

The datasets used and/or analyzed during the current study is available from the corresponding author on reasonable request.

Competing interests

All authors declared no competing interest in this study

Funding

Not Applicable

Authors’ Contribution

BDD: Coordinated and took part in the data collection, analysis data and writing of the manuscript.

HY: Helped obtained ethical clearance from Ghana Health Service Ethic Review Board for the study and proofread the final the manuscript before submission.

SA: Took part in the data collection and proofread the final version before submission.

OT: Took part in the data collection and proofread the final version of the manuscript before submission.

FAD: Took part in the data collection and proofread the final version of the manuscript before submission.

HOK: Took part in the data collection and proofread the final version of the manuscript before submission.

EAJ: Took part in the data collection and proofread the final version of the manuscript before submission.
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References


**Tables**

**Table 1:** Participants Demographic characteristics
<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age category</strong></td>
<td></td>
</tr>
<tr>
<td>10-16</td>
<td>85(42.5)</td>
</tr>
<tr>
<td>17-20</td>
<td>115(57.5)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
</tr>
<tr>
<td>married</td>
<td>3(1.5)</td>
</tr>
<tr>
<td>Single</td>
<td>197(98.5)</td>
</tr>
<tr>
<td><strong>Place of residence</strong></td>
<td></td>
</tr>
<tr>
<td>Rural area</td>
<td>46(23.0)</td>
</tr>
<tr>
<td>Urban</td>
<td>150(75)</td>
</tr>
<tr>
<td><strong>Educational background</strong></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>12(6)</td>
</tr>
<tr>
<td>Primary</td>
<td>25(12.5)</td>
</tr>
<tr>
<td>Junior high</td>
<td>91(45.5)</td>
</tr>
<tr>
<td>Senior high</td>
<td>64(32)</td>
</tr>
<tr>
<td>Other form of education</td>
<td>8(4.0)</td>
</tr>
<tr>
<td><strong>Parental occupation</strong></td>
<td></td>
</tr>
<tr>
<td>Health worker</td>
<td>1(0.5)</td>
</tr>
<tr>
<td>Trader</td>
<td>16(8.0)</td>
</tr>
<tr>
<td>Famer</td>
<td>3 (1.5)</td>
</tr>
<tr>
<td>Apprentice</td>
<td>1(0.5)</td>
</tr>
<tr>
<td>Other occupation</td>
<td>150(75)</td>
</tr>
<tr>
<td><strong>Family size</strong></td>
<td></td>
</tr>
<tr>
<td>Small family size</td>
<td>4(2)</td>
</tr>
<tr>
<td>Moderate family size</td>
<td>7(3.5)</td>
</tr>
<tr>
<td>Large family size</td>
<td>189(94.5)</td>
</tr>
<tr>
<td><strong>Smocking status</strong></td>
<td></td>
</tr>
<tr>
<td>Declined to answer</td>
<td>8(4.0)</td>
</tr>
<tr>
<td>Yes (Smock)</td>
<td>2(1)</td>
</tr>
<tr>
<td>No (Do not smock)</td>
<td>190(95)</td>
</tr>
</tbody>
</table>

Small family size is defined as 1-3 members in the household, moderate family size is defined as 4-6 members in the household, large family size is defined as 7 members and above in the household.

Table 2: Household Food Insecurity and Depression Prevalence among Pregnant Teenage Girls in Twifo Praso
### Table 3: Comparison of Means Differences of Participants’ Demographic Characteristics, Household Food Insecurity with Depression

<table>
<thead>
<tr>
<th></th>
<th>Low (n=58)</th>
<th>Moderate (n=65)</th>
<th>High (n=64)</th>
<th>F-statistics (df1, df2)</th>
<th>P-value^b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>60 (1.867)</td>
<td>67 (1.866)</td>
<td>64 (1.953)</td>
<td>0.411</td>
<td>0.663</td>
</tr>
<tr>
<td><strong>Systolic blood pressure (mmHg)</strong></td>
<td>60 (107.550)</td>
<td>67 (104.089)</td>
<td>64 (110.031)</td>
<td>0.63</td>
<td>0.554</td>
</tr>
<tr>
<td><strong>Diastolic blood pressure (mmHg)</strong></td>
<td><strong>60</strong> (68.317)</td>
<td><strong>67</strong> (66.865)</td>
<td><strong>64</strong> (68.593)</td>
<td><strong>4.369</strong></td>
<td><strong>0.014</strong></td>
</tr>
<tr>
<td><strong>Place of residence</strong></td>
<td>60 (1.867)</td>
<td>67 (1.882)</td>
<td>64 (1.750)</td>
<td>0.776</td>
<td>0.462</td>
</tr>
<tr>
<td><strong>Family size</strong></td>
<td>60 (1.000)</td>
<td>67 (1.045)</td>
<td>64 (1.063)</td>
<td>1.816</td>
<td>0.166</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td>60 (1.983)</td>
<td>67 (2.000)</td>
<td>64 (1.984)</td>
<td>0.542</td>
<td>0.582</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td>60 (3.400)</td>
<td>67 (3.119)</td>
<td>64 (3.109)</td>
<td>1.647</td>
<td>0.195</td>
</tr>
<tr>
<td><strong>Smoking status</strong></td>
<td>60 (1.867)</td>
<td>67 (1.940)</td>
<td>64 (1.906)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Household food insecurity</strong></td>
<td><strong>58</strong> (2.434)</td>
<td><strong>62</strong> (2.130)</td>
<td><strong>59</strong> (1.78)</td>
<td><strong>10.593</strong></td>
<td><strong>0.0001</strong></td>
</tr>
</tbody>
</table>

^aOne-way ANOVA, ^bPost-hoc analysis with Bonferroni correction that shows significant mean differences in: Diastolic blood pressure for low, moderate and high depression (P-value=0.014), and Household food insecurity for low, moderate and high depression depression (P-value=0.0001)

Table 4: Association of Household Food Insecurity, Family size and their Interaction for Depression among Teenage Pregnant Girls
<table>
<thead>
<tr>
<th>Variable</th>
<th>Moderate Depression</th>
<th>P-value</th>
<th>High Depression</th>
<th>P-value</th>
<th>Moderate Depression</th>
<th>P-value</th>
<th>High Depression</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COR (95%CI)</td>
<td></td>
<td>COR (95%CI)</td>
<td></td>
<td>AOR (95%CI)</td>
<td></td>
<td>AOR (95%CI)</td>
<td></td>
</tr>
<tr>
<td>Low family size</td>
<td>Ref</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.25(0.98-0.65)</td>
<td>0.004</td>
<td>1.03(1.16-3.54)</td>
<td>0.013</td>
<td>1.08(1.25-3.43)</td>
<td>0.004</td>
<td>1.08(1.17-3.71)</td>
<td>0.013</td>
</tr>
<tr>
<td>Large</td>
<td>1.94(1.19-3.17)</td>
<td>0.008</td>
<td>5.61(3.24-9.69)</td>
<td>0.001</td>
<td>1.79(1.03-3.13)</td>
<td>0.040</td>
<td>2.78(3.98-10.19)</td>
<td>0.001</td>
</tr>
<tr>
<td>Low food insecurity</td>
<td>Ref</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.13(0.04-0.37)</td>
<td>0.000</td>
<td>0.30(0.12-0.79)</td>
<td>0.015</td>
<td>0.25(0.98-0.65)</td>
<td>0.043</td>
<td>0.12(0.41-0.35)</td>
<td>0.001</td>
</tr>
<tr>
<td>High</td>
<td>0.30(0.12-0.78)</td>
<td>0.013</td>
<td>0.43(0.17-1.11)</td>
<td>0.082</td>
<td>0.33(0.13-0.84)</td>
<td>0.020</td>
<td>0.27(0.11-0.71)</td>
<td>0.008</td>
</tr>
<tr>
<td>Low Food insecurity*Low family size</td>
<td>Ref</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mod. Food Insec*Low family size</td>
<td>2.20(0.98-4.93)</td>
<td>0.055</td>
<td>1.72(0.66-4.48)</td>
<td>0.269</td>
<td>2.40(1.05-5.47)</td>
<td>0.038</td>
<td>1.87(0.70-4.99)</td>
<td>0.213</td>
</tr>
<tr>
<td>Mod. Food Insec*Mod. family size</td>
<td>3.63(1.54-8.57)</td>
<td>0.003</td>
<td>1.35(1.68-11.28)</td>
<td>0.002</td>
<td>1.98(0.80-4.91)</td>
<td>0.142</td>
<td>1.69(2.79-17.51)</td>
<td>0.001</td>
</tr>
<tr>
<td>Mod. Food Insec*Large family size</td>
<td>2.47(1.07-5.67)</td>
<td>0.034</td>
<td>2.41(0.93-6.27)</td>
<td>0.070</td>
<td>1.15(1.23-9.68)</td>
<td>0.019</td>
<td>1.61(3.73-24.96)</td>
<td>0.001</td>
</tr>
<tr>
<td>High Food insecurity*Low family size</td>
<td>1.77(0.81-4.81)</td>
<td>0.134</td>
<td>1.29(2.58-15.33)</td>
<td>0.0001</td>
<td>1.22(1.63-9.45)</td>
<td>0.002</td>
<td>1.24(1.57-11.41)</td>
<td>0.004</td>
</tr>
<tr>
<td>High food insecurity*Mod. family size</td>
<td>1.15(1.26-9.47)</td>
<td>0.016</td>
<td>2.51(3.07-23.59)</td>
<td>0.0001</td>
<td>2.40 (0.90-6.44)</td>
<td>0.081</td>
<td>2.06(1.09-5.97)</td>
<td>0.030</td>
</tr>
<tr>
<td>High Food insecurity*Large family size</td>
<td>1.75(0.74-4.14)</td>
<td>0.205</td>
<td>1.54(0.56-4.26)</td>
<td>0.404</td>
<td>1.88(1.89-12.60)</td>
<td>0.001</td>
<td>1.01(1.72-14.57)</td>
<td>0.003</td>
</tr>
</tbody>
</table>

Small family size is defined as 1-3 members in the household, moderate family size is defined as 4-6 members in the household, large family size is defined as 7 members and above in the household. The model is adjusted for educational level and parental occupation.