

Prevalence of Under Nutrition and Its Associated Factors among Adult Prison Inmates in Butajira Prison, Southern Ethiopia, 2020

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ABSTRACT

Malnutrition (undernutrition) occurs in an individual when the quantity and quality of his/her daily food intake are insufficient over some time. More than 10.1 million people are in jail around the globe and a total of 111,133 prisoners were expected to be found in Ethiopia. However, in low-income countries, nutrition-related issues are often neglected especially for vulnerable groups like prisoners. The aim of this study is to assess the prevalence of undernutrition and factor associated factors with it among adult prison inmates in Butajira prison.

BACKGROUND

All human beings need a balanced amount of nutrients for the proper functioning of the body system [1, 2]. It's well known, maintaining a good nutritional status is a human right [3, 4]. Anyone can experience malnutrition but people, who are living in a congregated setting (prisoners), children, women and the elderly are more vulnerable and most affected with Malnutrition than the general population [5, 6, 7]. Prison health is a neglected area, and prisoners also carry a greater burden of nutritional problems than other members of society. Moreover, prisoners harbor nutritional problems that are influenced both by the prison environment and by the kind of physical work they do while in prison. Furthermore, prisoners represent a nutritionally underserved population and at high risk of nutritional deficiency disorders [8, 9].

Food and agricultural organization/FAO/ estimates, about 805 million peoples globally, 26% in Sub-Saharan Africa and 26% in Ethiopia, are considered to be chronically undernourished [5, 6, 7]. More than 10.1 million people are in jail around the globe, and a total of 111,133 prisoners were expected to be found in Ethiopia. But, most of the prisoners have a poor nutritional status and poor health compared to the general population [10-13]. However, in low-income countries, nutrition-related issues are often neglected especially for vulnerable groups like prisoners [3, 4].

Poor nutrition could affect the concentration and learning abilities of prisoners, it results in episodes of violent or aggressive behavior with an increased risk of poor mental, physical health compared with the general population and a cause for high prevalence of energy depletion which leads to infectious diseases like Tuberculosis and HIV/AIDS [14].

In American prison, more than one-third of the inmates were found to be vitamin D deficient and vitamin D insufficient, by which duration of incarceration was significantly associated [15]. In Guinea prison, about five percent of the populations were affected with undernutrition. Moreover, around forty percent of prisoners and a few prison guards had weight loss within the previous 3-6 months [16].

Among nine prisoners six were malnourished and three had developed other diseases. During examination in all cases indicated undernutrition and overcrowding in prison [17].

Epidemics of beriberi (malnutrition) have been the leading cause of death in Cote d'Ivoire prison. However, the epidemics were stopped while after launching a nutritional feeding program at the main prison [18]. Prisoners were exposed to many unfavorable health and health-related factors including higher risks of mortality and injuries [19, 20, 21]. The aim of this study is to assess the prevalence of undernutrition and factor associated factors with it among adult prison inmates in Butajira prison, southern Ethiopia, 2019.

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Received Date: June 02, 2021; Accepted Date: september1, 2021; Published Date: September11, 2021

Citation: Melis T (2021), Prevalence Of Undernutrition And Its Associated Factors Among Adult Prison Inmates In Butajira Prison, Southern Ethiopia, 2020. J Nutr Disorders, 11:p650.

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METHODS

Study Area and Setting

The study was conducted at Butajira prison, in Butajira town southern, Ethiopia. Butajira is a town is located in the Gurage Zone; has an estimate of one hundred and thirty-one kilometer (135km) far from Addis Ababa, the capital city of Ethiopia. There is one general hospital & one health center in the town [22].

Around 23 prisons found in SNNPR Ethiopia, Butajira prison is one of the prisons that found in Butajira town, which serve for the prisoners that came from three woredas such as sodo, Mareko & Mesikan & two-sub city of Butajira & Bue'e. The prison had a total of 450 male & 6 female prisoners. A facility-based cross-sectional study was conducted from February 26-April 16, 2019.

SAMPLE SIZE AND SAMPLING TECHNIQUES

The sample size was determined by using single population proportion formula by considering the following assumptions: 95% CI, 5% margin of error and the value of "p" (p = proportion of prevalence) was taken as prevalence of undernutrition among prisoners which was found to be 25.2%[23]. Accordingly the calculated sample size with 10% non-response rate for this study was 319.

A Simple random sampling technique was employed to recruit a total of 319 study participants from 456 prisoners during the study periods. By taking the list of all male prison inmates ID numbers from the prison administration office we had prepared the sampling frame, then the computer (excel) was used to generate randomly selected study participants.

OPERATIONAL DEFINITION

Undernutrition (Yes): BMI (weight/ht²) of less than 18.5 [24]

Undernutrition (No): BMI (weight/ht²) of greater than 18.5 [24]

DATA COLLECTION TOOL AND PROCEDURE

The standardized data collection tool was developed through reviewing of related literatures.

Nutritional status of participants were determined by recording the weight and height of individuals and the dietary diversity scores of study participants were also determined by employing the 24 hours recall method. The heights and weights of the inmates were measured in light clothing and bare feet. The values were recorded to the nearest 0.1 cm and 0.1 kg, respectively. The heights had been measured while the inmates were standing erect in a Frankfurt position and the weights measured by using an electronic height-weight measuring instrument. When it was not possible to measure height as in the case of people unable to assume erect positions, height could be estimated from arm span.

First the questionnaire was prepared in English, translated to Amharic and then back to English. A week before the beginning

of actual data collection, a pre-test was done on 5% of the sample size in Wolkite prisoners. The data were collected by six diploma holders and supervised by one public health officer. Training was given for data collectors and supervisor for how to manage the data collection process. The data were collected by face-to-face interview by using interviewer administered structured questionnaire. Proper information was given for each Participant on the purpose of the study and after getting verbal consent interviewing respondents was cascaded based on questionnaire.

DATA PROCESSING AND ANALYSIS

Data were entered into Epidata version 3.1 and then exported to SPSS version 23 for further analysis. The descriptive analysis like percentage, frequency and mean were calculated. Bivariate and Multivariable logistic regression analysis were used to identify presence of associations between dependent and independent variables. In bivariate analysis variables with $p \leq 0.25$ were entered to multivariable logistic regression analysis. The Hosmer-Lemeshow test was used to check the appropriateness of the model for analysis. The possible effects of confounders were controlled through multivariable logistic regression analysis. The association between the explanatory and dependent variables were assessed at the p-value of 0.05. The variables that show p value < 0.05 were declared as statistically significant variables in multivariable logistic regression analysis. The degree of association between independent and dependent variables were assessed using crude odd ratio (COR) and adjusted odds ratio (AOR) for bivariate and multivariable logistic regression respectively with 95% confidence interval.

ETHICAL CONSIDERATION

Ethical clearance was obtained from the Institutional Review Board of wolkite University. A formal letter of cooperation was written for the Butajira prison administration. Informed verbal consent was obtained from each study participant. Before data collection, the data collectors were informed about COVID-19 related infection prevention and control activities.

Any respondent who was not willing to participate in the study had not to be forced to part. They were also informed that all data obtained from them would be kept confidential by using codes instead of any personal identifiers and are meant only for the study. The prisoners who were identified with mild acute malnutrition and moderate acute malnutrition (MAM) were linked to the clinic for the supplementary feeding programs and nutritional counseling.

RESULTS

Socio-demographic Characteristics of the Respondents

From the calculated sample size which is 319, the total number of respondents who were included in the study was 319, with a response rate of 100%. Out of these 317(99.3%) were male and the mean age of study participants was 34.5 ± 10.87 . Among study participants, 161(50.5%) were orthodox Christian followers. The

majority of them 188(58.9%) were married and 118(37%) can only read and write. A large proportion of prisoners 219(68.7%) were Gurage ethnic. See Table 1.

Table 1: Socio-demographic characteristics of for study of prevalence of undernutrition and associated factors among adult prisoner inmates in Butajira prison, southern Ethiopia, 2020. (n= 319).

| Variables | Categories | Numbers | Percent |
|------------------------|--------------------|---------|---------|
| Age | 18-25 years | 72 | 22.5 |
| | 26-35 years | 120 | 37.6 |
| | 36-45 years | 78 | 24.4 |
| | > 45 | 49 | 15.3 |
| Sex | Male | 317 | 99.3 |
| | Female | 2 | 0.7 |
| Religion | Orthodox | 161 | 50 |
| | Muslim | 116 | 36.4 |
| | Catholic | 9 | 2.8 |
| | Protestant | 33 | 10.3 |
| Marital status | Other | - | - |
| | Married | 188 | 58.8 |
| | Unmarried | 112 | 35.1 |
| | Divorced | 16 | 5 |
| | Widowed | 3 | 0.9 |
| | | | |
| Have Source of support | Yes | 147 | 46.1 |
| | No | 172 | 53.9 |
| Educational status | Not read and write | 47 | 14.7 |
| | Read and write | 118 | 37 |
| | Primary | 88 | 27.6 |
| | Secondary | 38 | 11.9 |

| | | | |
|--------|-----------|-----|------|
| | Tertiary | 28 | 8.8 |
| Income | No income | 133 | 41.7 |
| | 1-149 | 42 | 13.1 |
| | 150-499 | 78 | 24.4 |
| | 500-749 | 26 | 8.1 |
| | >749 | 42 | 12.7 |
| | | | |

BEHAVIORAL AND HEALTH-RELATED CHARACTERISTICS OF THE RESPONDENTS

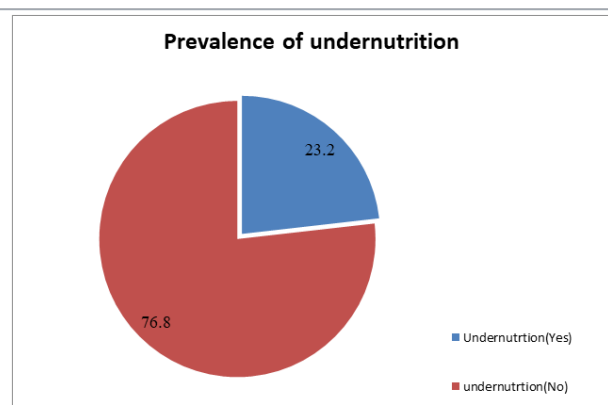
More than half of the participants 177(55.5%) had a history of self-reported illness and around 54(16.9%) of participants were current cigarette smokers from which most of them 53(98.15%) were smoke ≤ 10 cigarettes/day. Furthermore, about 74(23.2%) and 57(17.9%) of the participants were currently chewing chat and drink alcohol respectively. (Table2)

Table 2: Behavioral and health-related characteristics of the respondents for study of prevalence of undernutrition and associated factors in Butajira prison, Southern Ethiopia, 2020. (n= 319).

| Variable | Category | Frequency | Percent % |
|-------------------------|----------|-----------|-----------|
| Self-reported illness | Yes | 177 | 55.5 |
| | No | 142 | 44.5 |
| Hx of Smoking | Yes | 101 | 31.7 |
| | No | 218 | 68.3 |
| Current smoking | Yes | 54 | 16.9 |
| | No | 265 | 83.1 |
| No of cigarette/day | 1-10 | 53 | 16.6 |
| | >10 | 1 | 0.3 |
| Chew chat now | Yes | 74 | 23.2 |
| | No | 245 | 76.8 |
| Drink alcohol now | Yes | 57 | 17.9 |
| | No | 262 | 82.1 |
| Length of stay in month | 6-12 | 95 | 29.8 |
| | 13-24 | 96 | 30.0 |
| | 25-60 | 106 | 33.2 |
| | >60 | 22 | 7.0 |

| | | | |
|---------------------|----------|-----|------|
| Had additional food | Yes | 183 | 57.4 |
| | No | 136 | 43.6 |
| Dietary diversity | Low DD | 55 | 17.3 |
| | Mediu DD | 159 | 49.8 |
| | High DD | 105 | 32.9 |

NUTRITIONAL STATUS



Among the total participants, 74(23.2%) were undernourished. See (Figure 1)

Figure 1: Prevalence of undernutrition among adult Butajira prisoners, Southern Ethiopia, 2020, (n=319).

FACTORS ASSOCIATED WITH UNDERNUTRITION AMONG BUTAJIRA PRISON INMATES

In bivariate analysis, educational status, Source of support, previous occupation, history of illness, current smoking status, length of stay in Prison, previous history of jail, physical activity, getting additional source of food and DDS had been associated with undernutrition.

In multivariable logistic regression analysis Having History of jail, smoking, length of stay in prison and having no source of support were factors independently affecting Undernutrition.

Prisoners who had no source of support were 3.48 times higher odds Developing undernutrition than their counterpart (AOR 3.48,[95% CI:1.39,8.73].Study participants who were currently smoking had 3.11 times more likely to be undernourished as compared to the respondents who have not currently smoked (AOR 3.11, [95%CI 1.20, 8.02,]).This study also revealed that prisoners who had a history of previous incarceration were 3.35 times more likely to develop undernutrition than their counterparts (AOR= 3.35, 95% CI: (1.38, 8.10)). see Table 3.

Table 3: Binary and multivariable logistic Regression analysis for Factors associated with undernutrition among Butajira town prisoners, southern Ethiopia, 2019 (n=319).

| Variable s | Undernutrition | COR(95% C.I) | AOR (95% C.I) | P- Value | |
|------------------------|----------------|--------------|---------------|---------------------|-------------------------|
| | Yes | | No | | |
| Educational status | 18 | | 29 | 16.75 (2.09-134.24) | 5.66 (0.46-68.54) 0.173 |
| Not read and write | | | | | |
| Able to read and write | 38 | | 80 | 12.82 (1.67-97.93) | 3.80 (0.34-41.53) 0.274 |
| Primary | 15 | | 73 | 5.54 (0.69-44.04) | 1.39 (0.12-15.65) 0.786 |
| Secondary | 2 | | 36 | 1.50 (0.12-17.41) | 0.56 (0.03-9.75) 0.692 |
| Tertiary | 1 | | 27 | 1 | 1 |
| Had support | 12 | | 135 | 1 | 1 |
| Yes | | | | | |
| No | 62 | | 110 | 6.34 (3.25-12.36) | 3.48 (1.39-8.73) *0.008 |
| Previous occupation | 20 | | 19 | 1 | 1 |
| Unemployed | | | | | |
| Gov't employ | 2 | | 27 | 0.07 (0.015-0.337) | 0.44 (0.06-3.146) 0.416 |
| Merchant | 11 | | 67 | 0.156 (0.064-0.382) | 0.62 (0.18-2.063) 0.440 |
| Student | 3 | | 17 | 0.168 (0.042-0.665) | 0.50 (0.08-3.002) 0.449 |
| Other (farmer.) | 38 | | 115 | 0.314 (0.152-0.650) | 0.39 (0.14-1.054) 0.064 |
| Had history of illness | 51 | | 126 | 2.09 (1.20-3.63) | 1.68 (0.787-3.62) 0.179 |

| | | | | | |
|--------------------|----|-----|-------------------|--------------------|---|
| Yes | | | | | |
| No | 23 | 119 | 1 | 1 | |
| Smoke cigarrate | 28 | 26 | 5.12 (2.75-9.54) | 3.11 (1.207-8.028) | * |
| Yes | | | | | 0 |
| | | | | | 0 |
| | | | | | 1 |
| | | | | | 9 |
| No | 46 | 219 | 1 | 1 | |
| Chat chewing | | | | | |
| Yes | 22 | 52 | 1.57 (0.87-2.81) | 0.95 (0.355-2.584) | 0 |
| | | | | | . |
| | | | | | 9 |
| | | | | | 2 |
| | | | | | 8 |
| No | 52 | 193 | 1 | 1 | |
| Duration in prison | 12 | 83 | 1 | 1 | |
| 6-12 month | | | | | |
| 13-24 month | 24 | 72 | 2.30 (1.07-4.93) | 3.22 (1.233-8.426) | * |
| | | | | | 0 |
| | | | | | . |
| | | | | | 0 |
| | | | | | 1 |
| | | | | | 7 |
| 25-60 month | 31 | 75 | 2.85 (1.37-5.96) | 4.09 (1.573-10.63) | * |
| | | | | | 0 |
| | | | | | . |
| | | | | | 0 |
| | | | | | 0 |
| | | | | | 4 |
| >= 61 month | 7 | 15 | 3.22 (1.09-9.52) | 7.19 (1.75-29.56) | * |
| | | | | | 0 |
| | | | | | . |
| | | | | | 0 |
| | | | | | 0 |
| | | | | | 6 |
| History of jail | 26 | 21 | 5.77 (3.00-11.11) | 3.35 (1.38-8.10) | * |
| Yes | | | | | 0 |
| | | | | | . |
| | | | | | 0 |
| | | | | | 0 |
| | | | | | 7 |
| No | 48 | 224 | 1 | 1 | 1 |
| Physical activity | 29 | 166 | 1 | 1 | . |
| Yes | 45 | 79 | | | 0 |
| | 18 | 165 | | | 0 |

| | | | | | |
|------------------------------|----|-----|-------------------|--------------------|---|
| No | 56 | 80 | 3.26 (1.90-5.58) | 1.00 (0.472-2.119) | 0 |
| Additio nal food | 22 | 33 | | | 0 |
| Yes | 39 | 120 | 1 | 1 | 9 |
| No | 13 | 92 | 6.41 (3.54-11.62) | 2.009 (0.884.54) | 4 |
| Dietary diversity scor | | | 4.71 (2.13-10.41) | 1.65 (0.554.95) | 0 |
| Low IDDS | | | 4.7(3.13-10.41) | 1.65(0.5-5.495) | . |
| Mediu m IDDS | | | 2.30 (1.10-4.53) | 1.40 (0.579-3.41) | 4 |
| High IDDS | | | 1 | 1 | 5 |
| | | | | | 1 |
| | | | | | 3 |
| | | | | | 6 |
| | | | | | 4 |
| | | | | | . |
| | | | | | 4 |
| | | | | | 5 |
| | | | | | 1 |

DISCUSSION

The finding of this study showed that 23.2% of the adult prisoners were underweight. The prevalence of under nutrition in this study was in lined with study conducted in Bangladesh (22.1%), Nigeria (21%) and the northern part of Tigray (25.2%) [25, 26,23] respectively. But the finding of this study was higher than study conducted in Iran (13.8%), Papua New Guinea (5%) and Tanzania (6.6%) [27, 28,26] respectively. The justification might be different in economic status, lack of variety of food/ monotone's diet and the quality/quantity of food in in Ethiopia and other countries might be reason for variation.

However, the prevalence was lower than study done in north Gondar, Ethiopia (38.8%), in Kaliti prison, Ethiopia (43%), in Madagascar (38.4%) and in Pakistan (39.7%) [30, 31, 32,33] respectively. The justification might be time variation. As time goes the government act different strategies to cumbersome this problem.

In this study Respondents who had no source of support were more likely to develop undernutrition than those who had a Source of support. This finding is consistent study conducted in kaliti prison, Ethiopia [31] and the northern part of Ethiopia [23]. This might be because of the fact that those prisoner who was not getting social support has the risk of being alone or socially isolate which makes them face psychological problems like stress and being less productive and due to low income they cannot attain nutritious food. In general, the prisoner who got food or money support from family members, visitors or committee had an increased chance of improving dietary diversification and meal frequency in addition to prison food.

In this study Current cigarrate smoking status is associated with of undernutrition among the study participants. Those

Prisoners who were currently smoking were more likely to develop undernutrition as compared to counterpart. This finding is consistent with study done in guinea prison [28]. The justification might be due to that smokers might be affected by stress, sleep disturbance, associated loss of appetite and they are also more prone to nutrition depletion diseases like TB and other RTI. This deadly cycle of infection with addition of lack of provision of adequate food by prison had to make smokers more vulnerable to undernutrition than their counterparts.

The other justification might be because of nicotine that found in the cigarette can have a negative impact on brain and can affect the body absorbing ability to absorb a variety of vitamins and minerals lead to long time nutrient deficiency [34]. Also it might be because of being current smokers is associated with lower body weight, MUAC and plasma vitamin C concentration compare with non-smokers and smokers may have poor clinical outcome [35].

This study showed that duration of incarceration was significantly associated with undernutrition. Respondent who were stayed in the prison for 13-24 month, 25-60 month and ≥ 61 month were more likely to develop undernutrition than staying for 6-12 month. This result was in consistent with study conducted in Gondar, Tigray and Madagascar [30, 32, 35] respectively. The possible reason may be that stay in prison for longer period of time exposes the prisoners to unfavorable nutritional conditions and reserve of nutrients that prisoner stored in their bodies before incarceration diminishes over time with addition of exposure to inadequate diets over a long time period which leads them to undernutrition.

Having History of incarceration is associated with undernutrition. Those who had previous history of jail were more likely than their counterparts. This is consistent with study conducted in Tigray, Ethiopia [36]. The other justification might be because of those who who stayed longer time in prison develop mental illness, drug and alcohols use, economic crisis, exposed to illness which will expose them for undernutrition [37,38].

LIMITATION

As the study was used BMI to measure nutritional status of the prisoners, but the method doesn't take into account age and sex. Also there might be potential for recall bias when carried out 24 hr. dietary diversity and asking seven days meal frequency.

CONCLUSION

The prevalence of undernutrition in the prison setups was high. Having Hx of jail, smoking, length of stay in prison and no source of support were factors independently affecting Undernutrition in prisoners of Butajira. Increasing awareness should be applied for prisoners by stake holders on effects of smoking and income generating activities for prisoner.

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