

School feeding program: nutritional composition of school meals, nutritional status of schoolchildren and WASH facilities: the case of a Primary School, Arada sub-city, Addis Ababa, 2021

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ABSTRACT

The establishment of the school feeding program in all primary schools in Addis Ababa in 2020 fed a large number of schoolchildren and adolescents. It may contribute to food and nutritional security of schoolchildren if its safety, nutritiousness and dietary energy adequacy is guaranteed. This prompted the study to assess the nutritional adequacy of school meals to schoolchildren, the nutritional status of schoolchildren, and the status of water, sanitation and hygiene (WASH) facilities in the school premises. Meals were weighed and their nutritional content was determined based on Food Composition Table for Use in Ethiopia. Data on WASH were collected using structured questionnaires and by repeated visits. School meals mainly consisted of food products made from cereals and legumes. About 91% of the schoolchildren were beneficiaries of the School Feeding Program. School meals provided from 45% to 60% of calories required by schoolgirls and 35% to 60% of that required by schoolboys of all age groups. Protein content of school meals, however, satisfied the daily requirement of proteins for both sexes under the age of 13 years. A considerable proportion of schoolchildren and adolescents suffered from thinness (38%), undernutrition (17%) and underweight (51%). The majority of respondent (78.6%) washed their hands with soap and water because of obligatory Covid-19 precautions. Personal hygiene practice among all respondents and WASH facilities in the school premises was acceptable.

Keywords: School meals, nutritional adequacy, anthropometry, school WASH status.

INTRODUCTION

Poor health and insufficient food hamper the cognitive development of schoolchildren either through physiological changes or by reducing their ability to participate in learning activities (Zenebe et al, 2018). Proper nutrition is necessary for the physical, mental, and psychosocial development of children and adolescents aged 6 to 19 years (Wang and Fawzi, 2020). In Africa, an estimated 23 million school-age children go to school hungry every day (Bundy et al., 2018).

Schoolchildren and adolescents, coming from food insecure households benefit greatly from School Feeding Program (SFP) (Zenebe et al., 2018). School feeding program is defined as a program of provision of food to schoolchildren. It may be implemented as a program where children are fed in

school or families are given food as take-home rations for their schoolchildren. (Bundy et al., 2009; World Bank 2009).

School feeding first started in Ethiopia as early as 1994 by the World Food Program (WFP) in collaboration with the Ministry of Education (MoE) targeting schools in drought-stricken or conflict-affected areas (WFP, 2019). In Addis Ababa, a charity association started to provide school meals to schoolchildren from poor families in 2014/15. The Addis Ababa City Administration launched a wider school feeding program in 2019 where all school children in all public primary schools within the city administration were provided with breakfast and lunch, irrespective of family income (AAEB, 2020).

Although it is believed that meals served in school improve the nutritional status of schoolchildren (Muthayya et al., 2009), data regarding the nutritional values of the school meals are scanty (Ayogu et al., 2018). Bigson et al., (2019) evaluated the nutritional quality of school meals served to schoolchildren in Ghana and found that the mean daily nutritional values intake of the schoolchildren did not meet the recommended nutrient intake value.

Another concern in school feeding is food safety during mass catering. As SFP requires the construction of kitchens in school compound, schools should have safe water for drinking, sanitation, and maintenance of personal hygiene. According to a report on school hygiene in Ethiopia, the majority of surveyed primary schools did not have access to drinking water sources or adequate sanitation facilities for hand washing and excreta disposal (Haile, 2019). Implementing school feeding without concurrently establishing a functional hygiene and sanitation facilities might jeopardize the health of schoolchildren (Monney et al., 2014)

The aim of this study was, therefore, to assess the quantity of meals provided to each schoolchild, to see if the daily requirement of calories and proteins obtained therefrom is met, to evaluate the school sanitation conditions and personal hygiene practices of schoolchildren which are important for food safety and to measure the nutritional status of beneficiary schoolchildren.

MATERIALS AND METHODS

Description of the study area

Arada is one of the eleven sub-cities of Addis Ababa, located in the northwestern part of the city (Fig.1). The population of Arada sub city is 225, 999, of which 120, 036 are female. The sub-city comprises of 11 Woredas, and the old city center (Piazza) is located in this sub-city. The study was conducted in a primary school found in Worda-5 of the sub city. The total number of schoolchildren in the school was 1248, of which 690 are female and 558 male.

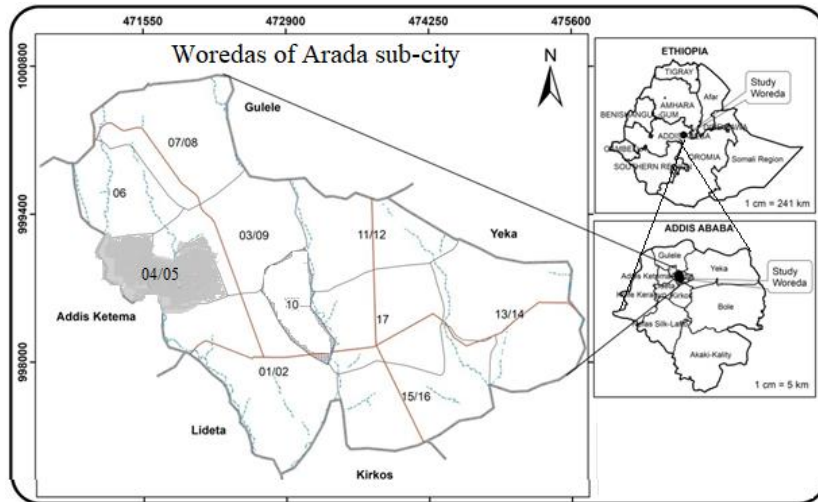


Fig. 1. Map of Arada sub-city and location of the study woreda (shaded).

The study was cross-sectional in design. Both qualitative and quantitative data were collected from all sampled schoolchildren and 11 kitchen workers during school days.

Sampling and Sample size determination

A single weekly menu is prepared by the Addis Ababa Education Bureau and implemented in all public primary schools in the city. The menu repeats every week through the academic year. The study school was purposively selected because it has a large number of schoolchildren and its location draws schoolchildren from neighboring sub-cities and woredas. Sample size was calculated based on a simple proportionality formula developed by Yamane (1967).

$$n = \frac{N}{1 + N(e)^2} \qquad n = \frac{1248}{1+1248(0.05)^2} = 303$$

Finally, with 5% non-response rate, a total of 318 schoolgirls and schoolboys were randomly and proportionally selected from each grade.

Data Collection

Food safety practices of schoolchildren and kitchen workers were assessed using structured questionnaires. Questions focused on handwashing practices and toilet hygiene (for schoolchildren) and cleaning of kitchen utensils, storage of perishable and leftover foods, ways and times of handwashing, cleaning of water collection and storage containers. Predesigned checklist was used to observe food preparation conditions and cleaning of kitchen utensils, and personal hygiene of food

handlers. Observations were also made on toilet conditions, handwashing facilities, and water drinking points during visits.

Samples of meals provided to schoolchildren were weighed during the week and the energy and protein content were determined using the Food Composition Table for Use in Ethiopia part III and IV (EHNRI, 1968-1997).

To assess anthropometric failures, weight and height measurements were taken from schoolchildren considered in this study. Nutritional status of schoolchildren was determined based on the anthropometric measurements. Nutritional status was evaluated using z-scores (<2z-score) of height-for-age (HAZ) for stunting; weight-for-height (WHZ) for thinness; and weight-for-age (WAZ) for underweight. BMI values were calculated using measured height in meters and weight in kilograms as

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height}^2 \text{ (meter)}} = (\text{kg/m}^2).$$

BMI weight categories were underweight (< 18.5), normal or desirable weight (18.5-24.9), and overweight (25.0-29.9) (Nuttall, 2015)

Technique of Data Analysis

The data was analyzed using the Statistical Package for Social Sciences (SPSS v20). Child anthropometric indices were calculated using Emergency Nutritional Assessment Software.

RESULTS AND DISCUSSION

A total of 318 school children were considered in this study which was conducted in mid-2021. The age range of both sexes was from six years to 16 years. Over 63% were female. More than 65% of families of schoolchildren and adolescents were in private business and others were working in government sectors (20%) or as daily laborers (12%). Although the school was situated in Arada sub-city, about 28% of schoolchildren and adolescents came from neighboring Addis Ketema and Gulele sub-cities. Schoolchildren and adolescents from three wordas in Arada sub-city made up 71.8% of respondents. Information was also collected from 13 kitchen staff.

Beneficiary schoolchildren and adolescents from the School Feeding Program

About 91% of the schoolchildren (6-13 years old) and adolescents (14-16 years old) considered in this study were beneficiaries of the School Feeding Program. Very few (3.1%) ate school meals only sometimes. About 6% of schoolchildren and adolescents brought own meals from home. Before the school feeding program started, 6.5% of the beneficiary students used to come to school without having breakfast and a few of them faced different kinds of attention problems such as sleeping during active class, feeling weak, dizzy and getting close to losing consciousness. This observation was

similar to the findings of Gbollie and Keamu (2017) who showed that hunger had big impact on the academic performance of schoolchildren and adolescents. Similarly, Destaw et al. (2022a) proved that the school feeding program in public schools of Addis Ababa positively contributed to educational outcomes in terms of class attendance and academic performance.

Feeding status of respondent schoolchildren and adolescents

Of the respondent schoolchildren and adolescents, 87% ate three times a day at home and about 13% ate only two times a day before school feeding was introduced (data not given). This indicated that a given proportion of families could not feed their children three times a day. About 48% of regular school feeding beneficiary respondents said that they ate at school until they were full, whereas about 52% felt that they could eat more, if available.

The weekly menu was repeated every week through the year (Table 1). Moreover, one of the daily menus was repeated on Fridays, and this happened to be mostly the meal consisting of rice and bread. School meals were not made available for schoolchildren during the weekends. In addition to providing energy, school meals also contributed markedly to the intake of protein, some amounts of fiber, various minerals and vitamins. WHO (2003) recommends that schoolchildren and adolescents should take food that satisfies their daily nutrient requirement.

Table 1: School feeding program menu and amount of food given per head

Days	Breakfast	Weight of food (k)	Lunch	Weight of food (g)
Monday	Firfir with tea	190g+1 cup	Enjera with Shiro/ missir stew.	190g/208g
Tuesday	Bread with tea	65g +1 cup	Rice with bread	275g + 65g
Wednesday	Bread with strawberry jam	65g +1 table Spoon	Enjera with Dinich stew	190g + 265g
Thursday	Firfir with tea	190g+1 cup	Enjera with Shiro stew and one boiled egg	190g + 240g
Friday	From the above list, one repetition is possible (Tuesday's menu is mostly repeated)			

The average energy content of school meals in this study was estimated to be 906 calories (CV, 12.2%) as calculated from the 'Food Composition Table for Use in Ethiopia' (EHNRI, 1968-199). This amount provided about 60% of the calorie requirement for six to eight year old schoolchildren (Table 2). It also provided 50% of the calorie requirement for schoolgirls of nine to 13 years old and 45% of schoolboys in the same age group. For adolescent schoolboys and girls of 14 to 16 years old, the proportion was 34% and 45% of the daily calorie requirement, respectively. This indicated that adolescent schoolboys and girls should obtain the remaining amount of calories at home or elsewhere to satisfy their daily requirement. School meals had a daily average protein content of 33.5g (CV, 13.3%). Therefore, they provided much over the daily requirement of proteins for schoolchildren aged six to eight years. The amount was also almost sufficient (about 99%) for the protein requirement of

schoolchildren of both sexes aged nine to 13 years (Table 2). After studying the nutritional contribution of school meals in over 50 schools in Addis Ababa, Destaw et al. (2022b) confirmed that school meals, beyond their role in alleviating hunger, also contributed suboptimal energy and various other nutrients to deprived school-age children and adolescents.

Table 2. Average energy and protein content of school meals vis-à-vis the daily requirement of moderately active¹ schoolchildren and adolescents

Age (yrs)	Sex	No.	Daily Energy ² (Calories)			Daily Protein ³ (grams)		
			Required	Obtained from meals	Proportion	Required	Obtained from meals	Proportion
6-8	M	11	1500	906	60%	19	33.5	176%
	F	27	1500	906	60%	19	33.5	176%
9-13	M	30	2000	906	45%	34	33.5	98.5%
	F	58	1800	906	50.3%	34	33.5	98.5%
14-16	M	34	2600	906	34.9%	52	33.5	64.4%
	F	72	2000	906	45%	46	33.5	72.8%

¹Moderate activity is equivalent to walking about 2.4 km to 4.8 km per day and light physical activity associated with typical day-to-day life (Zelman, 2005); ² according to Zelman, (2005); ³ according to Ames (2021)

Anthropometric findings

Anthropometric assessments of schoolchildren and adolescents, according to age, weight and height, showed varying prevalence of anthropometric failure (Table 3). In general, prevalence of thinness among schoolchildren and adolescents considered in this study was considerably high (38%). School girls of age group six to nine years and nine to 13 years had a higher prevalence of thinness (around 12%), whereas, among schoolboys, a higher prevalence of thinness (7.4%) was observed in the age group nine to 13 years. Thinness is caused by, among others, inadequate calorie intake (Baker, 1998). The prevalence of thinness among schoolchildren and adolescents observed in our study was much higher than those reported in a meta-analysis from Ethiopia (Hailegebriel, 2020), Meskan district, Southern Ethiopia (Wolde and Belachew, 2019), schools sampled from all over Addis Ababa (Destaw et al., 2021) but lower than that reported by Getaneh et al. (2019) from northwest Ethiopia. In our study, no thinness was observed in adolescents in the age group 13 to 16 years. Similarly, Narchi et al. (2021) reported that thinness was less prevalent among adolescents in UAE. In contrast to the findings of Yonas et al. (2018) and Walle (2021), schoolchildren and adolescents considered in our study did not manifest stunting (Table 3). As stunting indicates chronic or recurrent malnutrition (Khan et al., 2019), schoolchildren and adolescents considered in our study might have not been exposed to long term malnutrition.

Table 3. Anthropometric evaluation of schoolchildren and adolescents in the study school.

Age group	Sex	No.	Median		Thinness	Stunting	Undernutrition	Underweight
			Weight (kg)	Height (cm)				
6-9 (29.7%)	F	56	19	124	33 (12.3%)	-	2 (0.7%)	55 (20.4%)
	M	24	16	121	14 (5.2%)	-	8 (3%)	21 (7.4%)
9-13 (30.8%)	F	49	32	135	34 (12.6%)	-	19 (7.1%)	37 (13.8%)
	M	34	33	135	20 (7.4%)	-	12 (4.5%)	21 (7.8%)
13-16 (39.4%)	F	72	50	149	-	-	3 (1.1%)	2 (0.7%)
	M	34	54	149	-	-	3 (1.1%)	1 (0.4%)
		269			101 (37.5%)	-	47 (17.4%)	137 (50.9%)

W/H, weight for height; H/A, height for age; W/A, weight for age; BMI, body mass index.

Thinness (W/H, <2z-score); Stunting (H/A, <2z-score); Undernutrition (W/A, <2z-score); Underweight (BMI, <18.5mm).

In general, about 17% of undernutrition was observed among the schoolchildren and adolescents considered in this study. However, of the different age groups, a slightly higher level of undernutrition (7% and 4.5%) was observed in schoolboys and girls, respectively, of age groups 9 to thirteen years. Unlike the case seen in schoolboys, less than 1% of undernutrition was noted in schoolgirls of the age group six to nine years. In general, prevalence of undernutrition in our study was much lower than the finding from another sub-city in Addis Ababa (Degarege et al., 2015) and that from Burkina Faso (Erismann et al., 2017)

According to BMI measurements, a frequency of 20.4% and 13.8% of underweight was observed in schoolgirls of age six to nine and nine to 13, respectively. This was lower than the prevalence reported from Pakistan (Tanveer et al., 2022) but higher than that reported from Addis Ababa (Destaw et al. 2021) and Algeria (Oulamara et al., 2020). Frequency of underweight was negligible (<1%) in the age group 13 to 16. Overweight was not detected among our sample schoolchildren. In adolescents (13-16 years), however, it rose to 4.1% and 1.1% in schoolgirls and boys, respectively (data not given). Contrary to the observations of Tanveer et al. (2022), more girls were underweight than boys in schoolchildren of all age groups.

School kitchen conditions

Observation results considered the condition of school kitchen facility as satisfactory, although the food preparation room did not fulfil the required facilities and quality of an acceptable kitchen. Food safety assessment of the school kitchen showed that kitchen workers had a good level of knowledge and practice in food handling. All cleaned utensils with detergent and clean water, and kept cooked food covered until served. However, they complained of not having enough workspace and water point and sink within the kitchen to wash feeding and cooking utensils. They had to collect water for this purpose from other water points in the school premise. Poor kitchen facilities were among the factors that affected quality and quantity of food in the South African food and nutrition program (Mafugu, 2021). As the school feeding program undertaken by the Addis Ababa City Administration fully functioned during the period of this study, kitchens were short of several required equipment, utensils and cleaning facilities.

Hygiene and sanitation in school premises

Observational assessment of student hygiene focused on actions taken to prevent germs from entering into food. The assessment indicated that all schoolchildren and adolescents had good hand washing habit. All responding schoolchildren and adolescents knew about hand washing before eating. The majority (78.6%) washed their hands with soap and water because of the rules dictated by COVID-19 precautions during the time. The Addis Ababa Education Bureau supplied soap for handwashing. Nevertheless, 22% of respondents did not use soap to wash hands. Although there were hand washing

facilities near to the toilet, 85% of respondents said that no soap was available on the handwashing points. The appropriate handwashing practice level in this study was higher than that observed by Jemal (2018) and Bigson et al. (2020).

According to the respondents and on-site observation, schoolgirls had separate toilets from boys with own shower. The purpose of a shower was to change menstrual pads and wash their body during menstrual period. Previous studies indicated that personal hygiene facilities in schools in Ethiopia were very poor (Kumie & Ali, 2005). Our on-site visits, however, showed that almost all personal hygiene materials were available in the school premises.

The school got water for drinking or washing from the main municipal water line. Thus, the water could be considered as fit for human use. At the time of observation, there had been uninterrupted drinking water supply from the main source for the previous two weeks before the observation. Drinking water stations were not suitable for schoolchildren and adolescents with disabilities, though they were easily accessible to smaller schoolchildren and adolescents. There were a total of 60 drinking water points in the school, of which 57 were functional. A systematic review by Poague et al. (2022) indicated a lack of adequate WASH conditions and menstrual hygiene management requirements in all countries considered in their study.

With regards to toilets, water for flushing excreta in toilets was stored in a large barrel in the toilet building and students had to scoop water from the barrel to flush down excreta on toilet cubicles. About half of the toilet cubicles had a hole without lid. More than 48 toilet cubicles were made available for use by schoolchildren and adolescents. Of these, 20 were for use only by schoolgirls and 20 for use by schoolboys giving a student:toilet ratio of 1:37 for schoolgirls and 1:26 for schoolboys. The remaining cubicles were reserved for male and female teachers. All toilets were unlocked and accessible by all. Toilet facilities were not appropriate for schoolchildren and adolescents with disabilities. A study from Ghana showed that WASH in the schools was faced with challenges such as inadequate toilets and handwashing facilities (Mensah et al., 2022). The school in this study was, however, in a much better condition in WASH facilities when compared to public schools in another sub-city in Addis Ababa (Deyasso and Ashenafi, 2022).

CONCLUSIONS AND RECOMMENDATIONS

This study was carried out in 2021, when the Addis Ababa government School Feeding Program (SFP) fully started after interruption due to COVID-19 school closure. Though it might not show the effect of school meals on nutritional status of schoolchildren during the short study period, it may serve as baseline information for subsequent studies on the program. Findings showed that SFP might significantly contribute to improved nutritional status of schoolchildren and adolescents and consequently to school attendance and academic performance. The WASH conditions, however, need further improvement

because poor school hygiene and sanitation can compromise the safety of foods prepared in school kitchens. Contamination with disease causing organisms in the kitchen could result in an outbreak, which might affect hundreds of schoolchildren at the same time. Periodic training of kitchen staff in safe food preparation and arrangement of facilities in school kitchens must be tuned to address food safety issues in kitchens.

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