

Safety of food served in Mid-Day Meal program: An in-depth study in upper primary schools of Kolkata

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ABSTRACT

Introduction: The Mid-Day Meal (MDM) program is the world's biggest supplementary school lunch program and is being implemented all over India for primary and upper primary school students. To continue a healthy program, personal hygiene of food handlers and beneficiaries should be well maintained. **Objective:** This study aims at examining the status of food safety measures including personal hygiene of food handlers and beneficiaries of MDM. **Methodology:** An institution-based observational study with cross-sectional design was conducted in upper primary schools (government, government-aided school) in Kolkata over a period of 2 years from November 2016 to October 2018. A sample of 52 schools from a total of 515 schools were then selected by simple random sampling. Analyses were conducted using SPSS software (SPSS Inc., released 2007 SPSS for Windows, version 16.0). **Results:** Among 52 schools, 53.8% were government-aided schools and 46.2% were government schools. There were significant differences in cleaning practice by cook-cum-helper (CCH) ($\chi^2 = 4.4$, $df = 1$, $P = 0.036$), personal hygiene of CCH ($\chi^2 = 19.01$, $df = 1$, $P = 0.000$) and beneficiaries ($\chi^2 = 9.3$, $df = 1$, $P = 0.002$), practice during serving ($\chi^2 = 4.4$, $df = 1$, $P = 0.036$), and use and storage of oils and condiments in MDM ($\chi^2 = 27.7$, $df = 1$, $P = 0.000$) between government and government-aided schools. **Conclusion:** School authority should be concerned about maintaining proper hygiene. Adequate facilities and training program must be arranged for CCH to provide a healthy meal.

Keywords: Food safety, Mid-Day Meal, In-depth study

Introduction

In India, about two-thirds of the children under 5 years of age are malnourished, among whom 5%–8% are severely malnourished while the rest fall in the group of mild or moderate malnutrition.^[1] So it can be said that malnutrition is one of the most wide spread conditions affecting children's health. Many initiatives have been taken to prevent malnutrition, such as initiation of early exclusive breastfeeding, proper complementary feeding after 6 months, along with supplementary feeding through the Integrated Child Development Services (ICDS) Scheme and later through Mid-Day Meal (MDM) program at schools – all play a big role

in maintaining the optimum nutrition status of the child which has an effect in adequate growth, health, and cognitive behavioral development.

The MDM program is the world's biggest supplementary school lunch program and is being implemented in primary and upper primary government schools all over India, home to a quarter of the world's hungry, because it also enhances school enrolments and help children continue studies. The lunch is the only full meal the children of millions of poor families eat in a day; this encourages the parents to send their children to school rather than keep them in home to help with chores.^[2]

Various reports regarding MDM scheme revealed that there is ignorance of poor quality and bad management in the MDM scheme. More emphasis on food safety was given after an incident

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took place in Bihar in 2013 where almost 23 children had died by poison in the food provided to them under this scheme.^[2] Food safety and quality assurance of MDM should be an integral part of food handling procedures at the school kitchen. Food safety encompasses selection, handling, preparation, and storage of food in ways that prevent food-borne illness and contamination, of which hygienic practice is very important.^[3] Poor personal hygiene may be due to ignorance, lack of proper education, or inculcation of bad habits. The majority of diseases prevalent among school children are largely preventable by promotion of hygienic practice.

Food safety is an important aspect of promoting good health; generally, it has been neglected by everyone which requires immediate attention. Almost 1 in 10 people in the world fall ill after eating contaminated food which results in loss of 33 million healthy life years (DALYs) with nearly 40% of food-borne disease burden in under-5 children.^[4] Food safety, food security, and nutrition are inseparably linked. Unsafe food creates a vicious cycle of diarrhea and malnutrition, threatening the nutritional status of the most vulnerable. The international committee has tried to shed little light on this issue by making World Health Day theme: “From farm to plate, make food safe.” The food-borne diseases’ burden has often been underestimated due to underreporting where local incidents can quickly evolve into international emergencies affecting lakhs of people.^[4]

In 12th Five Year Plan, the MDM scheme guidelines have included “social audit” as an integral part in nine states. West Bengal was not included in the list.^[5] To continue a healthy program, personal hygiene of food handlers and beneficiaries should be well maintained. Till now, no such in-depth sincere efforts have been made to evaluate the program in this part of the country. With this background, this study aims at examining the status of food safety measures including personal hygiene of food handlers and beneficiaries of MDMD which will help the concerned authorities, health managers, and policy-makers to take fitting steps to make it highly effective. This study provides an opportunity to alert people especially the health practitioners who are the first point of contact of diseased. Food safety is a shared responsibility where family physicians play a major role in inculcating hygienic practices in community.

Methodology

An institution-based observational study with a cross-sectional design was conducted in upper primary schools (government and government-aided school) in Kolkata. The study was conducted over a period of 2 years from November 2016 to October 2018. A list of upper primary schools of Kolkata was collected from the Project Director, MDM office of West Bengal. The total number of upper primary schools present in Kolkata is 515. It was decided that 10% of total schools would be included in the study for feasibility and practical considerations of data collection by a single researcher; a sample of 52 schools were then selected by simple random sampling. From each school, food handlers

and the first five beneficiaries (students of class VI–VIII in each school) who arrived in the feeding venue on the date of interview were selected for data collection. Those schools that receive supply of cooked MDM from central kitchen were excluded. Approval was obtained from ethics committee of the institute. Written consent from the Director of Mid Day Meal Programme and Nodal Officer of Kolkata district was taken. The purpose of the study was explained to the school MDM authority and permission was taken from school headmaster. The purpose of the study was also explained to all the study participants and they were assured of confidentiality. After obtaining informed written consent and assent (as applicable), data were collected using predesigned, pretested, structured schedule. The schedule was prepared as per the guidelines to ensure quality, safety, and hygiene under the MDM scheme^[3] which comprised of the following:

1. Cleaning practice during preparation and after cooking by cook-cum-helper (CCH) – It was assessed based on 10 criteria and scored from 0 to 10. A score more than 8 (median) was considered satisfactory
2. Food safety measures during cooking and serving – It was assessed based on three criteria and scored from 0 to 3. A score of 3 (median) was considered satisfactory
3. Hygienic practice of CCH – It was assessed based on 10 criteria and scored from 0 to 10. A score more than 8 (median) was considered satisfactory
4. Personal hygiene of beneficiaries – It was assessed based on two criteria and scored from 0 to 2. A score of 2 (median) was considered satisfactory
5. Use and storage of oils and condiments – It was assessed based on three criteria and scored from 0 to 4. A score of 3 (median) was considered satisfactory.

Results

Background characteristics of schools

Among 52 schools, 53.8% were government-aided schools and 46.2% were government schools. About 48.1% of schools were up to secondary level and 50% schools were up to higher secondary level. The logo of MDM was painted on the entry gate in 69.2% of total study schools. About 75% of schools have menu board. Among 24 government schools, the total eligible students for MDM were 2767. Among them, 78.93% attended the schools on the day of visit and MDM was availed by 78.8% of the total students. Among 28 government-aided schools, the total eligible students were 5972; among them, 85.1% attended the schools on the day of visit and MDM was availed by only 56.7% of the total students. MDM is served in all upper primary schools from class VI to class VIII.

Cleaning of utensils, equipment, and other material during preparation and after cooking

Among 52 schools, 78.8% had satisfactory cleaning practice. Cleaning practice was less satisfactory in government-aided schools (67.9%) than government schools (91.7%)

($\chi^2 = 4.4$, $df = 1$, $P = 0.036$). Among government schools, 62.5% cleaned vegetables before cutting and 95.8% cleaned vegetable cutter regularly. The majority of them cleaned the kitchen floor (91.7%), kitchen slab (91.7%), table (94.4%), bench (95.8%), cupboard (94.4%), and mopped (95.8%) regularly. Cleaning practice was satisfactory in most of the government schools. Among government-aided schools, most of them cleaned vegetable cutters (100%), containers before cooking (82.1%), and kitchen floor (96.4%), and mopped (100%) regularly.

Cooking and serving practices

Among 52 schools, 78.8% had satisfactory cooking and service practice. Cooking and serving practices were more satisfactory (91.7%) in government schools, 95.8% of them used lid during cooking, 95.8% served hot meal, and 94.4% government schools used ladles with long handle. Cooking and serving practices were less satisfactory (67.9%) in government-aided schools. About 75% government-aided schools used lid during cooking, 75% of them served hot meal, and 78.8% used ladles with long handle. There was significant difference in cooking and serving practices between government and government-aided schools ($\chi^2 = 4.4$, $df = 1$, $P = 0.036$) [Table 1].

Personal hygiene

Personal hygiene of CCH was more satisfactory in government schools than government-aided schools [Table 2], whereas personal hygiene of beneficiaries was more satisfactory in government-aided schools than government schools [Table 3].

Regarding use and storage of oils and condiments of MDM

Among 52 schools, use and storage of oils and condiments MDM was more satisfactory in 63.4% of schools. There was a significant difference in use and storage of oils and condiments in MDM between government (44.6%) and government-aided

schools (71.4%). Double fortified salt was not used by any study schools. Around 54.2% of government schools and 71.4% of government-aided schools kept salt in covered container, and 70.8% of government schools and 67.9% of government-aided schools kept the container in dry area. Overall 85.7% of government-aided schools used AGMARK oil always, but only 44.4% of government schools used AGMARK oil always. Use and storage of oils and condiments in MDM was more satisfactory in government-aided schools than government Schools ($\chi^2 = 27.7$, $df = 1$, $P = 0.000$) [Table 1]. The distribution of schools according to various domains of food safety measures was depicted in Figure 1.

Discussion

This study was conducted to find out the deficiencies in executing this welfare program (through which the government feeds 120 million children every day across India) mainly on food safety measures. As there were no much previous studies which examined specifically the food safety, the discussion was done

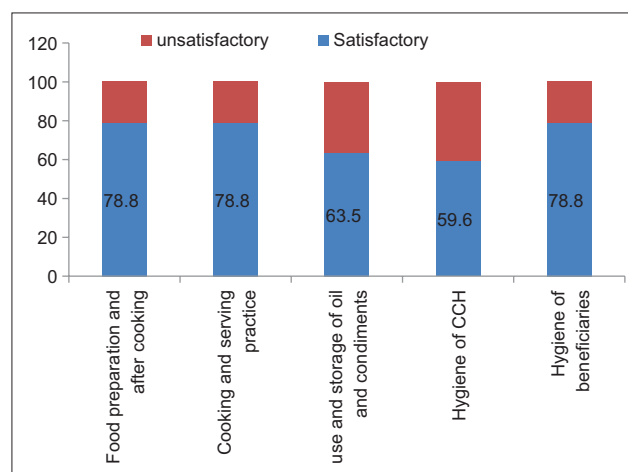


Figure 1: Distribution of schools according to their food safety measures ($n = 52$)

Table 1: Comparison of government and government-aided schools according to their food safety measures

Characteristics (score)	Government school ($n=24$) no. (%)	Government-aided schools ($n=28$) no. (%)	Chi-square (χ^2), df , P
Cleaning practice of CCH during preparation and after cooking			4.4, 1, 0.036
Unsatisfactory (<8)	2 (8.3)	9 (32.1)	
Satisfactory (≥ 8)	22 (91.7)	19 (67.9)	
Serving and cooking practice during MDM			4.4, 1, 0.036
Unsatisfactory (<3)	2 (8.3)	9 (32.1)	
Satisfactory (3)	22 (91.7)	19 (67.9)	
Hygiene of CCH			19.01, 1, 0.000
Unsatisfied (<8)	2 (8.3)	19 (67.9)	
Satisfied (≥ 8)	22 (91.7)	9 (32.1)	
Hygiene of beneficiaries	$n=120$	$n=140$	9.3, 1, 0.002
Unsatisfied (<2)	31 (25.8)	24 (17.1)	
Satisfied (2)	89 (74.2)	116 (82.9)	
Use and storage of oils and condiments			27.7, 1, 0.000
Unsatisfactory	11 (55.6)	8 (28.6)	
Satisfactory	13 (44.6)	20 (71.4)	

CCH: Cook-cum-helper, MDM: Mid-Day Meal

Table 2: Distribution of schools under study according to hygienic practice of CCH

Characteristics (score)	Government school (n=24) no. (%)	Government-aided schools (n=28) no. (%)	Total (n=52) no. (%)
Cleaning hand before cooking		28 (100)	
Yes (1)	23 (95.8)		51 (98.1)
Cleaning hand before cooking with soap	n=23	n=28	n=51
Yes	22 (95.7)	20 (71.4)	42 (82.4)
Cleaning hand before serving			
Yes (1)	22 (91.7)	12 (42.9)	34 (65.4)
Cleaning hand before serving with soap	n=22	n=12	n=34
Yes	21 (100)	7 (33.3)	28 (82.4)
Using gloves during cooking			
Yes (1)	22 (91.7)	12 (42.9)	34 (65.4)
Using gloves during serving			
Yes (1)	22 (91.7)	17 (60.7)	39 (75)
Washing gloves	n=22	n=17	n=39
Yes	22 (100)	17 (100)	39 (100)
Washing gloves with soap	n=22	n=17	n=39
Yes	21 (95.4)	13 (76.5)	34 (87.2)
Using apron during cooking			
Yes (1)	23 (95.8)	15 (53.6)	38 (73.1)
Using apron during serving			
Yes (1)	23 (95.8)	15 (53.6)	38 (73.1)
Using cleaned apron	n=23	n=15	n=38
Yes	21 (91.3)	9 (60)	30 (78.9)
Using head gear			
Yes (1)	23 (94.4)	15 (53.6)	38 (73.1)
Cutting nail regularly			
Yes (1)	23 (95.8)	22 (78.6)	45 (86.5)
Wearing bangles			
Yes (1)	24 (100)	27 (96.4)	51 (98.1)
Wearing finger ring			
Yes (1)	23 (95.8)	25 (89.3)	48 (92.3)
Hygiene of CCH			
Satisfactory (\geq median of attained scores - 8)	22 (91.7)	9 (32.1)	31 (59.6)

CCH: Cook-cum-helper

Table 3: Distribution of beneficiaries of schools according to personal hygiene (n=260)

Characteristics (score)	Government schools (n=120) no. (%)	Government-aided schools (n=140) no (%)	Total (n=260) no. (%)
Washing hand with soap before having food			
Yes (1)	70 (58.3)	86 (61.4)	156 (60)
Cleaning mouth after having food			
Yes (1)	106 (88.3)	127 (90.7)	233 (89.6)
Personal hygiene of beneficiaries			
Satisfactory (\geq median of attained score)	89 (74.2)	116 (82.9)	205 (78.8)

according to government guidelines and reports. This study found that cleaning practice was satisfactory in most of the government schools than government-aided schools. According to food safety guideline, cleaning accessories such as cooking utensils and crockery should be clean and in good condition.^[2] In a study carried out in Meerut, it was found that they cooked in clean utensils with a lid.^[6]

In this study, it was found that cooking and serving practices were more satisfactory (91.7%) in government schools than government-aided schools. Among government schools, 95.8% used lid during cooking, 95.8% served hot meal, and 94.4% used

ladles with long handle. Among government schools, 75% used lid during cooking and 75% of them served hot meal. Foods were served at the same time in all the study schools. In a study done in Karnataka, it was found that hot-cooked fresh meal was served at lunch time scheduled within 12:30–2:00 depending on the schools. Similarly, two members from either parents or mother's group must visit the school and observe the quality and quantity of meals served to the children.^[7] In Telengana, in a study done in Nizamabad, it was found that in 100% of upper primary schools, the food was served "hot" to the school children on daily basis, whereas in 96.2% of primary schools the food was served hot.^[8]

The headmaster or teacher has to be present while the food was being served and he or she should ensure that the meal being served was clean, healthy, and in appropriate quantity to the children. A report from Madhya Pradesh showed that 62.5% of kitchen-cum-store was in hygienic condition, properly ventilated, and away from classrooms, and overall 72.5% had satisfactory hygiene and safety environment.^[9] In Delhi schools, it was found that only 26% of the sampled schools had very good safety arrangements, while 39% good and 35% fair.^[10] In Tamil Nadu schools, because of firewood there is a lot of smoke and soot on walls and ceiling which is not healthy for CCH and children. Ensuring proper ventilation in kitchens and shifting to gas-based cooking will surely improve the situation.^[11]

Personal hygiene of CCH was more satisfactory in government schools than government-aided schools. Cleaning hand with soap before cooking and serving was done almost by both the schools. Use of gloves and cleaned apron was more in government schools than government-aided schools. According to food safety guidelines, biannual health checkups should be undertaken to ensure fitness for the job of CCH; the reports from Delhi and Tamil Nadu showed that no health checkups have been conducted. The CCHs should have adequate and suitable clean protective clothing and head covering the hair should be tied up neatly; it must be ensured that the CCHs at work wear only clean protective clothes and head covering is essential during MDM operation; in Delhi schools, 12.5% had unclean uniforms, 52.5% had unhygienic gloves and aprons, and 82.5% had clean and cut fingernails.^[10]

In this study, 78.8% of students had satisfactory personal hygiene. As this study was done in urban area of Kolkata, guardians and teachers were more aware about their hygiene. They had satisfactorily inculcated good personal hygiene habits in their children. In a study done in Meerut, it was found that the headmaster and teachers ensured that all children do practice hand washing properly daily. However, in 20 (25%) schools, it was not practiced and there was no availability of soap. Practice of hand washing was found to be significantly more in urban schools than in rural schools.^[6] According to food safety guidelines, washing hands with soap before and after eating should be vigorously promoted. Wherever proper hand washing facilities are either not available or inadequate for all children, buckets and mugs can be used to supplement the available facilities.^[3] In MP, it was found that in only 82.5% of schools CCHs encouraged students to wash their hands properly,^[9] whereas in a study done in Nizamabad, it was observed that teachers were encouraging the children to wash hands before and after the meals in 96.2% of primary schools and 100% of upper primary schools.^[8] In 50% of schools in Delhi, children were not encouraged to wash hands before and after eating short lunch breaks; teachers' apathy and water shortage are big constraints.^[10] In schools of TN, it was reported that the children washed their hands in the same bucket of water causing it to be unhygienic and murky, whereas in another school the students were found to be washing their plates and hands in a stagnant pond near the school.^[11]

According to food safety guidelines, oil with AGMARK quality symbol should be purchased. Only "double fortified salt" should be used for cooking MDMs. In this study, double fortified salt was not used by any study schools. About 54.2% of government schools and 71.4% of government-aided schools kept salt in covered containers.

Strength of the study

The strength of this study was the questionnaire was adapted from government guidelines of food safety measures.

Limitations

The study was a cross-sectional study; hence, findings of a single observation were collected, recorded, and analyzed. A follow-up study could have elicited more elaborately about the functioning and performance of MDM and CCH and whether the services could have had any impact on the society to which it caters to. However, because of time constraints, this was not possible. As the design of the study was cross-sectional, associations analyzed could not be considered as causal associations. Some of the responses were self-reported and recall-based, and hence answers may not be authentic.

Conclusion and Recommendation

For running a healthy uninterrupted MDM program, it is very important to sustain food safety. By maintaining proper hygiene, many communicable diseases such as diarrhea can be prevented. So school authority should be concerned about maintaining proper hygiene. Training program must be arranged for CCH for proper maintaining of hygiene. They should be provided with headgear, aprons, and gloves, and they should use them compulsorily during their work. Display board mentioning do's and don'ts for the CCH should be put up inside at a prominent place in the premise in local language. This study provides important information on the state of affairs of a flagship program.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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