Original Research

# FOOD SAFETY PRACTICES AND ASSOCIATED FACTORS AMONG MOTHERS OF UNDER-FIVE CHILDREN IN TIRUPATI: A COMMUNITY-BASED CROSS-SECTIONAL STUDY

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## ABSTRACT

**Background**: In India, most of the deaths among children (<5 years) are attributed to food and water contamination. Mothers are usually the final line of defence against food-borne illnesses. Thus, the role of mothers in ensuring food safety at home is well accepted. Food safety is a significant public health issue, as it aims to prevent or control foodborne illnesses.

**Aim:** To assess and evaluate knowledge, attitude, and practice towards food safety practices and associated factors among mothers of under-five children in Tirupati.

**Methodology:** A community-based, analytical, cross-sectional study was conducted among mothers of children under 5 years in Tirupati over 2 months. A total of 110 mothers were interviewed using a semi-structured questionnaire that included sociodemographic details and questions on knowledge, attitudes, and practices (KAP) regarding food safety. The association between KAP and sociodemographic factors was assessed using appropriate statistical tests.

**Results:** The mean age of the mothers was 26.76 (3.12) years. Mothers with good knowledge of food safety were 68.2%, mothers with a good attitude towards food safety were 48.3%, and mothers with good practices were 35.8%. Education, Socioeconomic status, good food safety knowledge, and attitude were significantly associated with good food safety practices.

**Conclusions:** About one-third of the mothers in the study area had poor food safety practices. Educational status, income, food safety knowledge, and food safety attitude were significantly associated with mothers' food safety practices. Food hygiene attitudes, knowledge, and education levels should be enhanced to improve food safety practices among mothers responsible for household food preparation.

**Keywords:** Food Safety, Knowledge, Attitude, Perception, Mothers of Under-Five Children.

## INTRODUCTION

Food safety is a significant public health issue, as it aims to prevent or control foodborne illnesses. In response to the growing number of foodborne diseases, governments worldwide are intensifying efforts to improve food safety. According to the WHO, contaminated food contributes to 179 million cases of diarrhoea in children each year, resulting in over 4,43,832 premature deaths in children under the age of 5.[1] However, both developed and developing nations share these deaths and illnesses.

*www.ajmrhs.com*
eISSN: 2583-7761

Date of Received: 20-05-2026
Date Acceptance: 28-05-2026
Date of Publication: 27-06-2026

The major causes of infection are inadequate sanitation, poor hygiene, and unsafe drinking water for cooking and cleaning. Among children under 5 years of age, the most common viral pathogens are rotavirus, norovirus, adenovirus, and astrovirus. Bacterial pathogens include Escherichia coli, Salmonella spp., Shigella spp., and Campylobacter spp., while parasitic pathogens include Cryptosporidium, Giardia, and Entamoeba species.[2,3]

Malnutrition-Children who die from diarrhoea often suffer from underlying malnutrition, which makes them more vulnerable to diarrhoea. Each diarrhoeal episode, in turn, worsens their malnutrition. Diarrhoea is a leading cause of malnutrition in children under 5 year's old.[2]

Other factors-Diarrhoeal disease can also spread from person to person, aggravated by poor personal hygiene. Food is another major cause of diarrhoea when it is prepared or stored in unhygienic conditions. Unsafe domestic water storage and handling are also important risk factors. Fish and seafood from polluted water may also contribute to the disease.[3] This study aimed to assess and evaluate knowledge, attitude, and practice towards food safety practices and associated factors among mothers of under-five children in Tirupati. Objectives: To assess the awareness about the food and water-borne diseases among mothers of children under five. To study the measures taken by the mothers of children under five to prevent the transmission of food and water-borne diseases. To find the association of awareness with sociodemographic factors of mothers of children under five.

## MATERIALS AND METHODS

**Study Setting and Population:** A community-based cross-sectional study was conducted in Tirupati, Andhra Pradesh, India, over a period of two months. The study population comprises mothers of children under five years old residing in the selected study area.

**Inclusion Criteria:** Mothers of children aged less than five years who are involved in household food handling and preparation activities and have been residing in the study area for at least six months prior to data collection were included in the study.

**Exclusion Criteria:** Mothers who are seriously ill at the time of data collection, those who are not involved in household food handling and preparation activities, and those who are unavailable after repeated household visits during the data collection period were excluded from the study.

**Sample size:** From the previously published literature, awareness of food- and water-borne diseases among mothers of children under five is 50%.2 Using this, the sample size is calculated with the formula: $4pq/l^2$. Z value at 95% confidence interval is 1.96. p = 50%. q= 100-50. l= Relative precision is 20% of p. Sample size was 110 with 10% non-response rate. $4pq/l^2$= 4*50*50/10*10.

**Data collection procedure**

The data was collected using a semi-structured questionnaire. The questionnaire comprised information about the sociodemographic characteristics of the study participants (Name, Age, education, occupation, religion, family type, marital status, socioeconomic status, type of diet),[1] Knowledge questions such as aware of food poisoning, Experienced food poisoning, aware of how to prevent food poisoning, use of gloves while handling food reduces the risk of food contamination, food poisoning can have health and economic effects on the society children, pregnant women and older individuals are more at risk of food poisoning, hand washing before cooking reduces the risk of food contamination, washing of hands after handling raw food prevents foodborne disease, diarrhoea can be transmitted through contaminated food, microorganisms can be found on the surface of human skin, nose and mouth of healthy handlers, Personal hygiene can prevent food contamination, contaminated water can be a vehicle for foodborne disease transmission, storing raw and cooked food together can cause contamination of food, Food handler having diarrhoea, flu and sore throat can pose risk of food contamination, leftover food smelling good is still safe to eat, dishing, serving and tasting food with unprotected hands can cross contaminate food, unkempt and dirty nails can easily spread bacteria, uncovered abrasion or cuts on fingers and hands can cause cross contamination of food, foodborne illness can be acquired from consumption of contaminated food, inadequate cooking of raw food like meat, chicken and vegetable can cause outbreak of foodborne illness).[1,4]

Awareness questions such as washing hands after touching raw foods, before food preparation, before touching cooked foods, after handling raw meat, after toilet visit, after sneezing or blowing nose with soap and water, wash raw food items and utensils before use, clean and sanitise food contact surfaces, separately store food and chemicals, and prepare food with whenever a wound is on the hand.[1] Attitude questions, such as their food safety practices, with a 4-scale Likert (1-always, 2-usually, 3-sometimes, and 4-never), 10 questions (yes/no) about their knowledge of food safety (potential sources of food contamination, cross-contamination, microbial contamination, transmission of food-borne disease,[1] Food safety practices such as personal hygiene and food-borne disease, food preservation techniques, safe food handling, person-to-person food-borne disease transmission, and hand washing knowledge.[1]

**Operational Definitions:**

**Knowledgeable:** Women who scored half or above values from all closed-ended questions about the knowledge of food safety practices.

**Positive attitude:** Women who scored half or above values from all attitude-related questions towards food safety practices.

**Good practices followed:** Women who scored half or above values from all closed-ended questions of food safety practices.

**Not Knowledgeable**: Women who do not even score half value from all closed-ended questions about the knowledge of food safety practices.

**Data analysis:**

The collected data was entered into Microsoft Excel. Numbers and percentages were calculated for qualitative data. The mean and standard deviation

was calculated for quantitative data. The chi-square test was used to assess the significance of differences between proportions. The Shapiro–Wilk test was used to test the normality. If the data are normally distributed, the Student's T-test was used to test the significance of the difference between the two means. If the data are not normally distributed, the Mann-Whitney U test was used. Multivariate logistic regression was used to identify the predictors of good practice. SPSS version 26 was used for data analysis. A p-value < 0.05 will be considered statistically significant.

## RESULTS

Most participants were aged ≥25 years (60.9%), with the remainder younger than 25 years. The majority were Hindu (87.3%), lived in nuclear families (89.1%), and with at least secondary education, with nearly half (48.2%) having intermediate-level education and 17.3% having a graduate or higher degree and most mothers were not in formal employment, with 78.2% reported as housewives and only small proportions working as private (13.6%), government (4.5%), or self-employed (3.6%) employees.

Fathers were comparatively better educated, with nearly four-fifths having at least intermediate education: 43.6% with intermediate and 35.5% with graduate or higher qualifications. In terms of occupation, almost all fathers were in paid work, mainly as private employees (45.5%) or self-employed (36.4%), with fewer in government jobs (14.5%) or as daily-wage labourers (3.6%). Most participants were from middle socioeconomic status (50.9%), with about half classified as middle class and nearly one-quarter as lower middle class (23.6%). A smaller proportion belonged to the upper-middle class (18.2%).

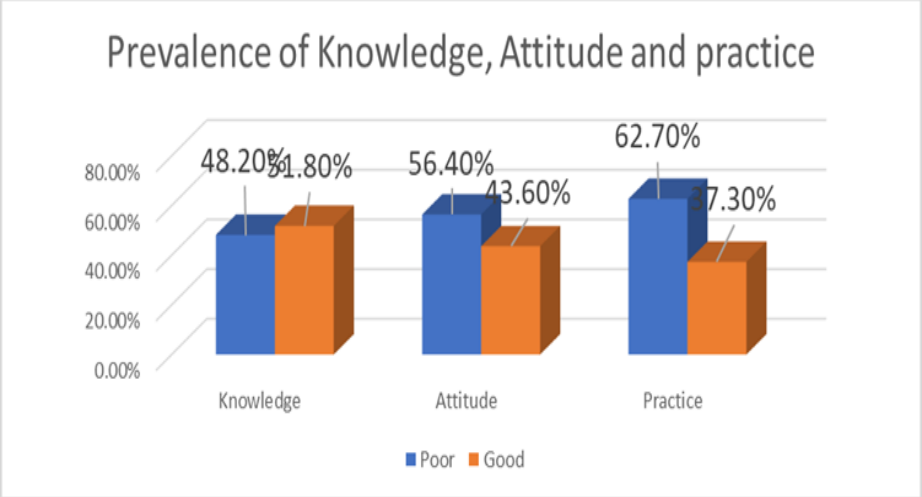


Figure 1: Prevalence of Knowledge, Attitude, and Practice

In Figure 1, 48.2% of participants had poor knowledge, 51.8% had good knowledge; for attitude, 56.4% had poor attitude and 43.6% had good attitude; and for practice, 62.7% had poor practice and 37.3% had good practice.

In the present study, the mean food safety knowledge score among mothers was 68.56 ± 5.75, indicating that, on average, participants had a reasonably good understanding of foodborne disease transmission and preventive measures. The mean attitude score was higher at 65.08±5.88, reflecting a generally favourable orientation towards safe food-handling behaviours and a strong conceptual acceptance of the importance of food safety in protecting children under five. By contrast, the mean practice score was notably lower at 59.95±3.511, suggesting that, despite relatively good knowledge and positive attitudes, actual implementation of recommended food safety behaviours in the household remained suboptimal.

Table 1: Association between Food Safety Practices and Socio-Demographic Profile

| Characteristics | | Poor Practice No. (%) | Good Practice No. (%) | Total No. (%) | P Value |
|---|---|---|---|---|---|
| Age | <25 | 27(62.8) | 16(37.2) | 43(100) | 0.991 |
| | >25 | 42(62.7) | 25(37.3) | 67(100) | |
| Religion | Hindu | 61(63.5) | 35(36.5) | 96(100) | 0.424 |
| | Muslim | 8(61.5) | 5(38.5) | 13(100) | |
| | Christian | 0(0) | 1(100) | 1(100) | |
| Family Type | Nuclear | 60(61.2) | 38(38.8) | 98(100) | 0.352 |

| | | | | | |
|---|---|---|---|---|---|
| | Joint | 9(75) | 3(25) | 12(100) | |
| Education of Mother | Illiterate | 1(100) | 0(0) | 1(100) | 0.384 |
| | Primary | 3(75) | 1(25) | 4(100) | |
| | Middle | 6(85.7) | 1(14.3) | 7(100) | |
| | Secondary | 19(73.1) | 7(26.9) | 26(100) | |
| | Inter | 29(54.7) | 24(45.3) | 53(100) | |
| | Graduate and above | 11(57.9) | 8(42.1) | 19(100) | |
| Occupation of Mother | Government Employee | 3(60.0) | 2(40.0) | 5(100) | 0.827 |
| | Private Employee | 8(53.3) | 7(46.7) | 15(100) | |
| | Self-Employment | 3(75.0) | 1(25.0) | 4(100) | |
| | Others (House Wife) | 55(64.0) | 31(36.0) | 86(100) | |
| Education of Father | Illiterate | 1(50) | 1(50) | 2(100) | 0.193 |
| | Primary | 5(100) | 0(0) | 5(100) | |
| | Middle | 4(66.7) | 2(33.3) | 6(100) | |
| | Secondary | 9(90.0) | 1(10.0) | 10(100) | |
| | Inter | 28(58.3) | 20(41.7) | 48(100) | |
| | Graduate and above | 22(56.4) | 17(43.6) | 39(100) | |
| Occupation of Father | Government Employee | 9(56.2) | 7(43.8) | 16(100) | 0.209 |
| | Private Employee | 28(56.0) | 22(44.0) | 50(100) | |
| | Self Empoyment | 28(70.0) | 12(30.0) | 40(100) | |
| | Daily Wage Labourer | 4(100) | 0(0) | 4(100) | |
| Socioeconomic Status | Upper | 3(42.9) | 4(57.1) | 7(100) | 0.001 |
| | Upper Middle | 7(35.0) | 13(65.0) | 20(100) | |
| | Middle | 34(60.7) | 22(39.3) | 56(100) | |
| | Lower Middle | 24(92.3) | 2(7.7) | 26(100) | |
| | Lower | 1(100) | 0(0) | 1(100) | |
| Knowledge | Poor | 43(81.1) | 10(18.9) | 53(100) | <0.001 |
| | Good | 26(45.6) | 31(54.4) | 57(100) | |
| Attitude | Poor | 51(82.3) | 11(17.7) | 62(100) | <0.001 |
| | Good | 18(37.5) | 30(62.5) | 48(100) | |

Socioeconomic status, knowledge, and attitude are all statistically significantly associated with practice levels ($p \leq 0.001$). Participants from lower socioeconomic classes had a higher proportion of poor practices than those from upper- and upper-middle-class backgrounds. Those with good knowledge and good attitude demonstrated substantially better practice than those with poor knowledge and poor attitude (both $p < 0.001$).

Table 2: Association of Sociodemographic Factors with Good Food Safety Practice

| **Variable** | | **Adjusted Odds ratio OR (95% CI)** |
|---|---|---|
| Age group | < 25 years | 1 |
| | > 25 years | 0.851 (0.313-2.313) |
| Education of the father | Upto intermediate | 1 |
| | Graduate and above | 0.852 (0.234-3.100) |

| | | |
|---|---|---|
| Occupation of father | Employed | 1.771 (0.590-5.321) |
| | other | 1 |
| Education of the mother | Upto intermediate | 1 |
| | Graduate and above | 1.156 (0.264-5.071) |
| Occupation of the mother | Employed | 1 |
| | Home maker | 1.000 (0.288-3.473) |
| Socioeconomic status | Below middle class | 1 |
| | Middle class and above | 5.074 (0.965-26.687)* |
| Knowledge | Poor | 1 |
| | Good | 4.464 (1.622-12.287)* |
| Attitude | Poor | 1 |
| | Good | 5.393 (1.008-14.486)* |

Significant*

As shown in Table 2, multivariate logistic regression analysis reveals that, compared to the below middle-class socioeconomic status, study subjects in the middle class and above were 5 times (AOR:5 .074 (95% CI 0.965-26.687) more likely to have good food safety practices. Compared to mothers with poor knowledge, mothers with good knowledge were 4.4 times (AOR:4.464 (95% CI 1.622-12.287) times greater likelihood of having good food safety practices. Compared to mothers with poor attitudes, mothers with good attitudes were 5.3 times more likely to have good food safety practices (AOR:5.393 (95% CI 1.008-14.486).

## DISCUSSION

This study was conducted to assess food safety practices and their associated factors among mothers of children under 5 years, as well as their knowledge, attitudes, and practices toward food safety. In the present study, 60.9% of the mothers were aged ≥25 years, while 39.1% were younger than 25 years. In comparison, Dagne[5] et al. reported that 24.3% of participants were younger than 30 years, and 75.6% were aged 30 years or older, indicating a higher proportion of older mothers than in our study. Likewise, Geetha Mani[6] et al. observed that 36% of the study population were less than 30 years of age and 64% were more than 30 years of age, again reflecting a relatively older study population compared to ours, possibly due to differences in sampling methods, inclusion criteria, and local demographic patterns.

In our study, 87.3% of participants were Hindus. This is comparable to the findings of Rajat J[7] et al., who reported that 91.4% of their study population were Hindus. In contrast, Dagne[5] et al. observed that 78.7% of participants were Christians and 21.3% were Muslims, reflecting the predominant religious composition of the Ethiopian population in the study area. In contrast, our study was carried out in an Indian setting with a predominantly Hindu population. In the present study, 89.1% of the participants belonged to nuclear families, whereas Mani G[6] et al. reported that 63% of their study subjects were from nuclear families. In contrast, only 25.3% of the participants in the study by Rajat J[7] et al. were from nuclear families, which is notably lower than in our study and may be attributed to their predominantly rural study setting, where joint families are more common. In our study, 48.2% of participants had education up to the intermediate level, whereas Rajat J[7] et al. reported that 40.9% of their study population had higher secondary education. Furthermore, 78.2% of the participants in our study were homemakers, which is comparable to the 88.7% reported by Rajat J[7] et al.; this similarity likely reflects that both studies were conducted among mothers of young children in rural communities, where women are predominantly engaged in household responsibilities.

The higher proportion of poor knowledge, attitude, and practice in our study compared to that of Dagne[5] et al. may be attributed to several factors they include differences in study setting and population characteristics, such as sociodemographic profile and prior exposure to health education interventions; variations in the data collection tools, scoring methods, and operational definitions used to categorize “good” and “poor” KAP; and differences in the timing and local context of the studies, including the intensity of ongoing public health programs and campaigns related to the food safety practices.

In the present study, age, religion, family type, and parental occupation were not significantly associated with food safety practices among mothers of children under five, as the distributions of good and poor practices were broadly comparable across these socio-demographic categories. By contrast, socioeconomic status demonstrated a clear, statistically significant gradient, with mothers from lower-middle and lower socioeconomic classes showing a markedly higher prevalence of poor food-handling practices than those from upper- and upper-middle-class backgrounds, highlighting the constraining effect of limited economic resources on the adoption of safe food-handling behaviours.

Educational status of both parents showed a consistent trend toward better practice with

increasing levels of education, although this association did not reach statistical significance in the current sample; however, Dagne[5] et al. identified secondary and higher education as independent predictors of good food safety practice, suggesting that the influence of formal education may become more apparent in larger studies or differing settings. In line with findings from Debarq town and other KAP investigations, strong associations were observed between knowledge, a favourable attitude, and good food safety practices in our study, suggesting that cognitive and attitudinal factors may be more influential and modifiable determinants of food safety behaviour than socio-demographic variables alone.

In the present study, most sociodemographic variables did not show a statistically significant independent association with food safety practice after adjustment in the logistic regression model. Mothers aged >25 years had lower odds of good practice than those aged <25 years (AOR 0.851; 95% CI: 0.313–2.313), but the confidence interval crossed unity, indicating no meaningful age effect. Similarly, higher educational status of the father (graduate and above vs up to intermediate; AOR 0.852; 95% CI: 0.234–3.100) and mother (graduate and above vs up to intermediate; AOR 1.156; 95% CI: 0.264–5.071), as well as the occupational status of fathers (employed vs other; AOR 1.771; 95% CI: 0.590–5.321) and mothers (homemaker vs employed; AOR 1.000; 95% CI: 0.288–3.473), were not significantly associated with food safety practice, suggesting that, in this population, basic sociodemographic differences alone do not strongly influence household food handling behaviour.

In contrast, socioeconomic status and psychosocial factors showed stronger associations. Mothers belonging to households in the middle class and above had higher odds of good food safety practice compared with those from below middle-class families (AOR 5.074; 95% CI: 0.965–26.687), with the lower limit of the confidence interval close to 1, indicating a probable but borderline significant effect of economic disadvantage on unsafe practices. This association is biologically and socially plausible, as lower socioeconomic groups may face constraints in accessing safe water, proper storage facilities, and adequate kitchen infrastructure, which can hinder the implementation of recommended practices.

Knowledge and attitude emerged as the most important predictors of food safety practice. Mothers with good knowledge had significantly higher odds of good practice than those with poor knowledge (AOR 4.464; 95% CI: 1.622–12.287), and those with a favourable attitude similarly had higher odds of good practice compared with those with a poor attitude (AOR 5.393; 95% CI: 1.008–14.486). These findings indicate that cognitive and attitudinal domains are key modifiable determinants of food safety behaviour, consistent with KAP models and with previous work from Dagne[5] et al. and other settings, where good knowledge and positive attitudes were also independently associated with better practice.

## CONCLUSION

It can be concluded that nearly half of the mothers of children under 5 have poor knowledge of food safety and disease transmission via contaminated food. More than half of them had a poor attitude toward safer food-handling practices. About 60% of them were practising poor food safety, while the remaining 40% were following good food safety practices. Lower socioeconomic status, poor knowledge, and poor attitude towards food safety practices were significantly associated factors with poor practices.

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**How to cite this article:** Visweswara Rao Guthi, K V Koti Reddy, Nagarjuna M, Haritha, Ajeetha B, Priadarsine M M6, Konduru Lakshmi7, Sushmitha SK, FOOD SAFETY PRACTICES AND ASSOCIATED FACTORS AMONG MOTHERS OF UNDER-FIVE CHILDREN IN TIRUPATI: A COMMUNITY-BASED CROSS-SECTIONAL STUDY, Asian J. Med. Res. Health Sci., 2026; 4 (2):1174-1180.
**Source of Support:** Nil, Conflicts of Interest: None declared.