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Practice-wise adoption of clean milk production practices and its correlation among tribal dairy farm women in Chhotaudepur district of Gujarat state

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ABSTRACT

The present study was conducted to assess the practice-wise adoption of clean milk production (CMP) practices and to determine the relationship between the adoption level and selected socio-economic characteristics of tribal dairy farm women in Chhotaudepur district of Gujarat. The study was conducted in Pavi-Jetpur and Bodeli talukas of Chhotaudepur district. From each taluka, three villages were selected and 20 tribal dairy farm women were selected from each village, resulting in a total sample of 120 respondents. Data were collected through a pre-tested structured interview schedule. The adoption of clean milk production practices was measured using a three-point continuum of “always”, “sometimes,” and “not at all”, assigned scores of 2, 1 and 0, respectively. The collected data were analyzed using frequency, percentage, mean score, rank and Pearson's correlation coefficient. The findings revealed that, among the different clean milk production practices, care to be taken by the milker during milking and care of milking utensils ranked first, with a mean score of 1.10 each, followed by care after milking (0.90), care of animal shed (0.70) and care of milch animals (0.50). The majority of respondents (70.83%) belonged to the medium adoption category, followed by 15.83 per cent with low adoption and 13.34 per cent with high adoption. Correlation analysis revealed that annual income ($r = -0.1969^{**}$) and milk production ($r = -0.2048^{**}$) had a negative and highly significant relationship with the adoption level of clean milk production practices. In contrast, education ($r = 0.3759^{**}$), experience in animal husbandry ($r = 0.1902^{**}$), occupation ($r = 0.2130^{**}$), social participation ($r = 0.2083^{**}$) and mass media exposure ($r = 0.2379^{**}$) showed a positive and highly significant relationship with the adoption level of clean milk production practices. The findings indicate the need for strengthening education, extension support, social participation and access to mass media to improve the adoption of clean milk production practices among tribal dairy farm women and thereby contribute to improved milk quality and sustainable dairy development.

Keywords: Clean milk production, tribal dairy farm women, adoption, adoption level, correlation, Chhotaudepur, Gujarat.

INTRODUCTION

The dairy sector is one of the most important components of the Indian agricultural economy and plays a vital role in strengthening rural livelihoods, employment and nutritional security. India continues to be the world's largest milk-producing country, with milk production showing a sustained upward trend owing to improvements in animal husbandry practices, dairy development programmes, technological interventions and increasing participation of rural households. The livestock sector makes an important contribution to agricultural Gross Value Added (GVA), while dairying provides a regular source of income and employment and serves as an important livelihood diversification strategy, particularly for landless, marginal and small farm households. Unlike crop production, which is often seasonal and vulnerable to climatic fluctuations,

dairy farming can provide a relatively continuous flow of income and food to rural families (Government of India, 2024).

Women play a central role in the Indian dairy production system and are actively involved in almost all livestock-related activities, including feeding and watering animals, cleaning animal sheds, fodder collection, calf care, milking, processing and, in many cases, marketing of milk and milk products. The contribution of women becomes particularly important in tribal communities, where livestock rearing is closely integrated with household farming systems and rural livelihoods. Previous studies have indicated that women's participation in extension activities, access to mass media, social participation, education and experience in animal husbandry influence their knowledge and adoption of improved dairy management practices (Patel and Chauhan, 2018; Meena *et al.*, 2019). Thus, improving

women's knowledge and adoption of scientific dairy practices can contribute not only to enhanced milk production but also to better household income, nutritional security and overall livelihood improvement.

Milk is a highly nutritious food and, at the same time, a highly perishable commodity. Its rich nutrient composition provides favourable conditions for the multiplication of microorganisms when hygienic conditions are not maintained. Contamination may occur at different stages of milk production and handling through unclean animals, contaminated udders, unhygienic hands of milkers, dirty utensils, contaminated water, unclean animal sheds, improper milking procedures and inadequate storage conditions. Such contamination can deteriorate milk quality, reduce its keeping quality and potentially increase public-health risks. Consequently, maintaining hygienic conditions from the animal and milking environment through collection, handling and storage is essential for ensuring safe and quality milk (Codex Alimentarius Commission, 2022). Clean Milk Production (CMP) encompasses a set of scientific and hygienic practices adopted before, during and after milking to minimize physical, chemical and microbial contamination and to maintain the natural quality and nutritional properties of milk. These practices include maintaining animal health and cleanliness, ensuring udder and milker hygiene, using clean milking utensils, maintaining cleanliness of the animal shed, filtering and properly handling milk, and adopting appropriate storage and transportation practices. Adoption of CMP practices can improve milk quality and shelf life, reduce spoilage and rejection, minimize the risk of milk-borne infections, enhance consumer confidence and improve the economic value of milk. Therefore, CMP is not merely a milk-quality issue but is also an important component of sustainable dairy development, farm profitability and public health (Singh *et al.*, 2015; Codex Alimentarius Commission, 2022).

Although the importance of hygienic milk production is well established, the adoption of CMP practices at the farm level is not necessarily uniform across all practices or categories of dairy farmers. Existing studies have largely focused on general knowledge, awareness or overall adoption of improved dairy practices, while comparatively less attention has been given to practice-wise adoption of specific clean milk production practices among tribal dairy farm women. Moreover, recent evidence specifically examining the association between socio-economic characteristics of tribal dairy farm women and their adoption of individual CMP practices remains limited, particularly in Gujarat. This represents an important research gap because adoption is often practice-specific and a farmer may regularly follow certain hygienic practices while neglecting others. Identifying such practice-wise differences can help extension personnel develop more

focused and need-based interventions rather than relying only on generalized dairy-management recommendations. Chhotaudepur district of Gujarat provides an appropriate setting for the present investigation because of its substantial tribal population and the important role of livestock rearing in the livelihood systems of rural households. Dairy activities are closely associated with household-level resource use and women's labour in the district. However, the specific extent to which tribal dairy farm women adopt individual clean milk production practices and the socio-economic characteristics associated with such adoption, require systematic assessment. A district-specific study is therefore justified to generate location-specific evidence that can complement broader studies on dairy development and help identify practices requiring greater extension attention.

In view of the above research gap and the livelihood and public-health significance of hygienic milk production, the present study was undertaken in Chhotaudepur district of Gujarat to assess the practice-wise adoption of clean milk production practices among tribal dairy farm women and to examine the relationship between selected socio-economic characteristics and their adoption of clean milk production practices. The findings are expected to provide useful empirical information for extension agencies, dairy development organizations and policymakers in formulating need-based training, awareness and intervention strategies for improving milk quality, strengthening dairy-based livelihoods and promoting safer milk production among tribal farming communities.

MATERIALS AND METHODS

The present investigation was conducted in Chhotaudepur district of Gujarat State. A multistage sampling procedure was followed for the selection of the study area and respondents. Pavi-Jetpur and Bodeli talukas of Chhotaudepur district were purposively selected considering the presence of a sizeable tribal population and a considerable number of tribal dairy farm women actively engaged in animal husbandry. From each selected taluka, three villages were purposively selected based on the prevalence of tribal dairy farming and the availability of eligible respondents, resulting in a total of six villages. From each selected village, 20 tribal dairy farm women actively engaged in dairy farming and animal husbandry were purposively selected, constituting a total sample size of 120 respondents. A well-structured and pre-tested interview schedule was developed in consultation with experts in Dairy Science, Veterinary Science, and Agricultural Extension Education to collect the required information. The interview schedule was prepared in accordance with the objectives of the study. Before the final

survey, the interview schedule was pre-tested with a small group of respondents outside the selected study area and necessary modifications were made to improve its clarity, relevance and validity.

The practice-wise adoption of clean milk production practices was measured using a three-point continuum, namely 'Always', 'Sometimes' and 'Not at all', with scores of 2, 1, and 0, respectively. The total adoption score for each respondent was computed by summing the scores obtained for all the selected practices. Further, the mean score for each practice was calculated and the practices were ranked based on their mean scores to determine the relative extent of adoption. The overall adoption was measured with mean and standard deviation. The required data were collected through the personal interview method. The collected data

were systematically classified, tabulated, and analyzed using appropriate statistical tools such as frequency, percentage, mean score, rank and Pearson's correlation coefficient to achieve the objectives of the study and draw meaningful conclusions.

RESULTS AND DISCUSSION

Practice-wise adoption of clean milk production by tribal dairy farmwomen

An attempt was made to ascertain practice-wise adoption of clean milk production by dairy farmwomen. The data regarding practice wise adoption of clean milk production are presented in Table 1.

Table 1 : Practice-wise adoption of clean milk production by tribal dairy farmwomen

n=120

Sr. no.	Clean milk production practices	Always	Sometimes	Not at all	Total score	Mean score	Rank
1	Care of milch animal	12 (10.00)	35 (29.17)	73 (60.83)	059	0.50	IV
2	Care be taken by the milker while milking	51 (42.50)	27 (22.50)	42 (35.00)	129	1.10	I
3	Care of milking utensils	52 (43.34)	25 (20.84)	43 (35.82)	129	1.10	I
4	Care of animal shed	28 (23.30)	31 (25.80)	61 (50.90)	087	0.70	III
5	Care after milking	39	26	55	104	0.90	II

Figures in brackets indicate percentages

The practice-wise adoption of clean milk production (CMP) practices among tribal dairy farm women is presented in Table 1. The findings indicated that care to be taken by the milker during milking and care of milking utensils were the most frequently adopted practices, each securing the first rank with a mean score of 1.10. These were followed by care after milking (mean score = 0.90), care of the animal shed (mean score = 0.70) and care of milch animals (mean score = 0.50), which ranked second, third and fourth, respectively. The comparatively higher adoption of care of milking utensils (43.34%) and care to be taken by the milker while milking (42.50%) may be attributed to the direct and visible relationship of these practices with milk cleanliness and quality. Further, practices such as using clean and dry utensils, cleaning milking utensils after milking, maintaining personal hygiene, keeping fingernails short, covering the head during milking and avoiding smoking or chewing tobacco during milking can be performed at the household level with comparatively less expenditure. The relatively better adoption of these practices may therefore be associated with their simplicity, familiarity and direct

relevance to milk quality and marketability.

However, the adoption of practices related to care of milch animals was comparatively low, with a mean score of 0.50 and 60.83 per cent of the respondents reported that they did not follow these practices regularly. Similarly, adoption of animal shed care was relatively low, with a mean score of 0.70 and 50.90 per cent of respondents reported that they did not follow the recommended practices. The lower adoption of these practices may be attributed to inadequate technical knowledge regarding animal hygiene and health management, additional labour requirements, limited availability of resources, financial constraints and inadequate access to veterinary and extension services. These findings indicate that although farmwomen were comparatively more attentive to immediate milking and utensil hygiene, greater emphasis is required on preventive animal health and hygienic housing management for achieving comprehensive clean milk production. These findings are in agreement with Gade *et al.* (2014), Usadadiya and Prajapati (2023), Usadadiya *et al.* (2023) and Singh *et al.* (2024).

Table 2 : Overall adoption level of clean milk production by tribal dairy farmwomen

Sr. no.	Adoption level	Frequency	Percentage
1	Low (below 24.34 score)	19.00	15.83
2	Medium (between 24.34 to 34.04 score)	85.00	70.83
3	High (above 34.04 score)	16.00	13.34
Total		120	100.00

The distribution of tribal dairy farmwomen according to their overall adoption of clean milk production practices is presented in Table 2. The findings revealed that the majority of the respondents (70.83%) belonged to the medium adoption category, followed by 15.83 per cent who had a low level of adoption and 13.34 per cent who had a high level of adoption. Thus, the overall adoption of clean milk production practices among the tribal dairy farmwomen was predominantly medium.

The predominance of medium adoption may be attributed to the adoption of simple and familiar practices that can be routinely performed at the household level, particularly those related to milking hygiene, cleaning of utensils and routine animal-shed management. However, adoption of practices requiring specialized technical knowledge, additional inputs or greater financial investment, such as udder and teat disinfection, post-milking teat dipping, proper drainage, pucca flooring and fly-control measures, was comparatively low. Consequently, although the respondents had adopted several basic clean milk production practices, the adoption was not sufficiently comprehensive to place the majority of respondents in the

high adoption category. The relatively small proportion of respondents in the high adoption category (13.34%) indicates considerable scope for improving the adoption of recommended clean milk production practices. Similarly, the 15.83 per cent of respondents belonging to the low adoption category require greater attention through targeted extension interventions. Differences in technical knowledge, access to veterinary and extension services, availability of resources, financial capacity and exposure to dairy-related information may have contributed to the variation in adoption levels. These findings are in agreement with Gade *et al.* (2014), Usadadiya and Prajapati (2023), Usadadiya *et al.* (2023) and Singh *et al.* (2024).

Relationship between profile of tribal dairy farm women and their adoption of clean milk production practices:

An attempt was also made in this investigation to ascertain the relationship between socio-economic characteristics of the tribal dairy farm women and their adoption of clean milk production practices. The data in this regard are presented in Table 3.

Table 3 : Relationship between the profile of tribal dairy farm women and extent of adoption

Sr. No.	Independent variable	Co-efficient of correlation value 'r'
1	Age	-0.1234 NS
2	Education	0.3759**
3	Experience in animal husbandry practices	0.1902**
4	Occupation	0.2130**
5	Land holding	0.0340 NS
6	Annual income	-0.1969 **
7	Herd size	-0.0450 NS
8	Milk production	-0.2048 **
9	Family type	0.1115 NS
10	Social participation	0.2083**
11	Mass media exposure	0.2379**

* 5 per cent level of significance

** 1 per cent level of significance

The correlation analysis presented in Table 3 indicated that annual income ($r = -0.1969^{**}$) and milk production ($r = -0.2048^{**}$) had a negative and highly significant relationship with the adoption of clean milk production practices. Conversely, education ($r = 0.3759^{**}$), experience in animal husbandry ($r = 0.1902^{**}$), occupation ($r = 0.2130^{**}$), social participation ($r = 0.2083^{**}$), and mass media exposure ($r = 0.2379^{**}$) showed a positive and highly significant association with adoption. The variables age, landholding, herd size, and family type did not exhibit any significant relationship with the adoption level.

The positive association of education, farming experience, social participation, and mass media exposure indicates that respondents with better access to knowledge, extension services and social networks were more likely to adopt recommended clean milk production practices. The negative association of annual income and milk production with adoption suggests that higher values of these variables were associated with comparatively lower adoption scores in the present study. However, the observed correlation does not establish a causal relationship, and the underlying reasons for this pattern require further investigation. The present findings corroborate those of Rathod *et al.* (2012), Kumar *et al.* (2017) and Verma *et al.* (2021)

CONCLUSION

The study revealed that among the various clean milk production practices, care to be taken by the milker during milking and care of milking utensils were the most widely adopted practices, followed by care after milking, care of the animal shed and care of milch animals. The findings indicate that tribal dairy farm women had relatively higher adoption of hygienic practices directly associated with the milking process than practices related to animal health and housing management. The correlation analysis demonstrated that education, occupation, experience in animal husbandry, social participation, and mass media exposure were significantly and positively associated with adoption of clean milk production practices. In contrast, annual income and milk production exhibited a significant negative association with adoption. The study highlights the need to strengthen extension education programmes, practical training, mass media communication and capacity-building initiatives targeted at tribal dairy farm women to improve the adoption of recommended clean milk production practices. Such interventions will enhance milk quality, improve public health, increase farmers' incomes and ensure sustainable dairy development in tribal regions.

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