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From Home-produced to Store-bought- How Lifes Changing: Consumption of Milk and Milk Products through Decades

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Authors' contributions

This work was carried out in collaboration between both the authors. Authors YB and KK conceived of the presented idea. Author YB designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author KK encouraged author YB to investigate the idea and reviewed the study. Both the authors read and approved the final manuscript.

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ABSTRACT

Aims: This study aimed present a comprehensive picture of trends in the consumption pattern of milk and milk products with the objective to determine the shift in their consumption through different decades and locations.
Study Design: Cross-sectional study
Methodology: The study was conducted in Garhwal region of Uttarakhand. The sample population comprised of both male and female subjects between the age group of 15 years to 55 onwards. The respondents were categorized into three age groups range as- 15-35 years, 36-55 years, and above 56 years. Starting from the age of 5 years, each age group is also categorized decade-wise. Being descriptive in nature the study was carried out through a field survey method using face-to-face interviews.
Results: The results showed that during earlier decades, milk was consumed daily by the majority of the population depending upon the fact that it was produced by the domesticated cattle and easily available. However, a high frequency of daily consumption was observed among the 15-35

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years of age group, though it was more of purchased from store or dairy. Curd, however, was earlier prepared by milk produced at home, now mostly prepared at home from milk bought from stores or dairy. The practice of preparing buttermilk and butter/*ghee* milk products daily from the milk produced by domesticated cattle is experiencing a great drop, especially in the rural areas. *Paneer* (Indian cottage cheese) has got popular in the past few decades, though its consumption is highly dependent upon the location and economic condition of the household.

Conclusion: There is a great need for promoting cattle rearing and dairy farming for increasing production and consumption of home-produced healthy products from milk. Making people aware of the dietary requirements of milk and milk products during various life stages is also of prime importance.

Keywords: Milk and milk products; dairy products; consumption trends; curd; buttermilk; Indian cottage cheese; butter.

1. INTRODUCTION

Rapid economic growth, urbanization, and globalization have resulted in a dietary transformation in India [1]. The nutrition transition has brought about rapid changes in the structure of the Indian diet. The replacement of traditional home-cooked meals with ready-to-eat, processed foods has contributed to an increased risk of chronic diseases in urban Indians [2]. India is the largest producer of milk in the world [3]; however, nearly two-fifths (36%) of the participants did not report any consumption of milk and milk products. The total milk production is the highest in the world, but productivity per animal is extremely low by international standards [2].

Diets in India have not transformed sufficiently to overcome major gaps in intakes of micronutrient-rich foods [1]. Milk is an excellent source of well-balanced nutrients and also exhibits a range of biological activities that influence digestion, metabolic responses to absorbed nutrients, growth and development of specific organs, and resistance to disease [4]. Milk consumption is part of many cultures and is recommended in most dietary guidelines around the world [5]. Milk contributes to a significant proportion of daily requirements for protein and calcium at a population level [6]. High-quality proteins, such as milk proteins, enable essential amino acids (EAA) requirements to be met with less caloric intake compared with lower-quality proteins [7]. Górska-Warsewicz H analyzed the milk and dairy products and their nutritional contribution to the average Polish diet and concluded that cheese and milk provide the most energy and nutrients. These main groups are significant sources of calcium as each provides about 22% of this nutrient (the total contribution of calcium from dairy products is 55%). The share of milk and cheese groups in the supply of phosphorus, potassium, and magnesium is twice lower. Milk provides almost twice as much riboflavin as cheese [8]. In addition, dairy products provide high-quality protein with peptides and bioactive factors that have specific effects on growth. The lipid portion of dairy supplies energy as well as essential and nonessential fatty acids [9].

According to the study conducted by Miller LC, milk consumption is related to higher height for age and weight for age z-scores for children above 60 months old and to higher head circumference z-score for children age 24 to 60 months old. Out of all the animal-source foods consumed, milk had the strongest and most consistent relationship to child growth [10].

A diet high in milk and dairy products reduces the risk of childhood obesity and improves body composition in adults. This likely contributes to lower the risk of developing type 2 diabetes [11]. The evidence from observational studies confirms that there is no association between consumption of milk and dairy products and all-cause mortality [11-13]; including the risk of cardiovascular diseases [11,13]. According to a review by Thorning TK et al., there is an inverse association of a high intake of milk and dairy products with the risk of hypertension and stroke. A positive effect of milk and dairy intake on bone health in childhood and adolescence was also observed. Also, the consumption of milk and dairy products probably protects against colorectal cancer, bladder cancer, gastric cancer, and breast cancer [11].

Thus, milk and milk products are an essential part of our diet and should be consumed following the national dietary guidelines. In the present study, the household consumption pattern of milk and milk products of the Garhwal

region of Uttarakhand was assessed in different decades, in both rural and urban areas with the objective to determine the trends in their consumption through different decades and locations. The milk and milk products for which the data was recorded were milk, curd, buttermilk, butter/*ghee*, *paneer* (Indian cottage cheese).

2. MATERIALS AND METHODS

The present study was conducted in the Garhwal region of Uttarakhand. The state lies between a 77°34¢ E to 81°02 E longitude and 28°44 and 31°28 N latitude. For sample selection, the state was divided into different strata, i.e., districts; then blocks, rural and urban areas, and then families. There was a total of 13 districts in Uttarakhand state from which 7 districts lie in the Garhwal region; Out of these, three districts Dehradun, Haridwar, and Tehri Garhwal were selected by using purposive sampling methods. From each district, two blocks and from each block two rural and two urban areas were randomly selected for the study. Nearly twenty families were taken from each area. A total of 480 families representing different socio-economic statuses were selected for the study. The study comprised of both male and female subjects between the age group of 15 to 56 onwards, who voluntarily agreed to participate in the study. Out of each rural and urban area, twenty families were selected. The selection of respondents was done by using the snowball sampling method also known as network, chain, or reputational sampling. The respondents were categorized into three age groups range as- 15-35 years, 36-55 years, and above 56 years. Starting from the age of 5 years, each age group is also categorized decade-wise e.g. age group of 56 years and above was divided into six decades starting from the age of five years. The plan of study was carried out in two phases, i.e., the development of tools for data collection and pilot study. Being descriptive in nature the study was carried out through the field survey method. First, a structured interview schedule was prepared for the collection of data and then, a pilot study was conducted on 30 non-sampled respondents, before actual administration of the tools, and tested for accuracy to make necessary changes in the interview schedule. The survey was carried out by using face-to-face interviews structured to characterize the consumption pattern of milk and milk products during different periods of their life. The collected data were tabulated and analyzed statistically with the help of approved statistical techniques. The statistical formula used was frequency and percentage.

3. RESULTS AND DISCUSSION

3.1 Consumption Trends for Milk (Routinely/Daily): Decade wise Represented as % of Population

Among 56 years and above age group, the routine consumption of milk was decreased through decades. During 1961-70 the consumption of milk in rural areas was 94.38% which decreased to 56.25% after 2011. Similar trends were seen in urban areas, 92.45% in 1961-70 to 32.50% after 2011. This was seen majorly because in earlier decades respondents used to domesticate cattle at a larger level as compared to the present time. However, with changes in decades, the age group 36-55years also the consumption of milk decreased from 89.76% (rural) and 87.10% (urban) in 1971-80 to 50% (rural) and 36.36% (urban) after 2011 onwards. A rise in the consumption of younger age group (15-35 years) was observed which was mainly attributed to the purchase of milk from dairy or stores. The increased consumption was observed during the first decade of life in this age group (Fig. 1).

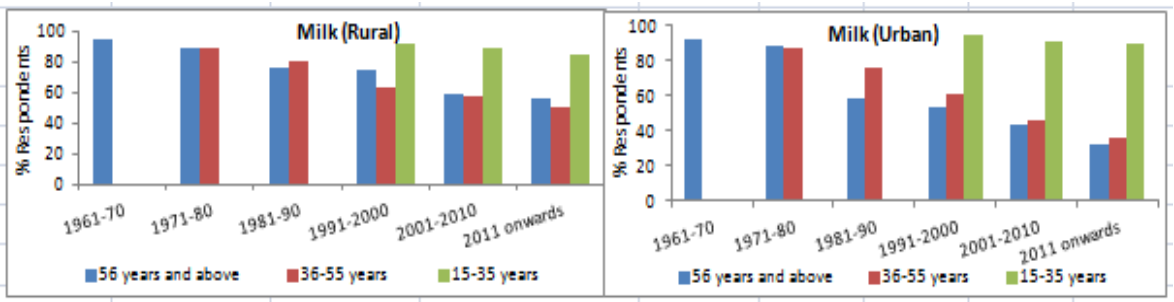

Fig. 1. Consumption trends for Milk (routinely/daily)

Dror DK reported that the consumption of milk and dairy products among adolescents is diminishing considerably in industrialized nations over the recent past [9]. El-Qudah JM revealed in their study that one-tenth of the Jordanian adolescents (n = 302; aged: 11–18 years) reported no serving of milk consumption [14]. Zingone F et al. quoted in their study that consumption of milk has been declining sharply in recent decades, particularly in developed countries. They investigated the average consumption of milk and dairy products in the Campania region of Italy and found out that 22.2% (260 of 1173) of responders from Campania do not drink milk, and 18.1% (213 of 1173) drink lactose-free milk, mainly because of gastrointestinal symptoms. The vast majority of the sample population chose to avoid consuming milk without undergoing the breath test for lactose intolerance or consulting a doctor. However, the population sample consumed dairy products quite frequently [15].

3.2 Consumption trends for Curd (Homemade- Routinely/Daily): Decade wise Represented as % of Population

A decline in the consumption of curd (homemade) was observed through the decades. Specifically, homemade curd was taken into consideration during the interview. In the age group 56 years and above, the routine consumption of curd was seen among 71.25% (rural) and 58.75% (urban) of respondents during 1961-70 while only 32.50% (rural) and 15% (urban) of respondents consume it routinely after 2011 onwards. Among the age groups 36-55 years and 15-35 years, consumption was reported to be increasing mainly in the urban areas. The respondents in the urban areas reported purchase of milk from dairy or stores and then preparing curd from it at home. The earlier decades of the life of these age groups show an increased consumption as compared to the later ones (Fig. 2).

The results of a study conducted by Jain A et al. among children aged 5-18 years in Jaipur, Rajasthan (India) concluded that only a small proportion (4.6%) of Indian children and adolescents (n = 1000; aged: 5–18 years) failed to consume milk and milk products on a daily basis[16].

3.3 Consumption trends for Buttermilk (Homemade- Routinely/Daily): Decade wise Represented as % of Population

As the decline in the milks and curds routine consumption was observed, the consumption of homemade buttermilk also declined (attributed mainly to the reduction in the domestication of cattle and migration towards cities). The consumption during 1961-70 was 78.75% (rural) and 58.75% (urban) which was reduced to 32.50% (rural) and 11.34% (urban) after 2011. The percentage of the population consuming buttermilk daily dropped steeply among the 15-35 years age group. While it was 66.10% in rural areas during 1991-2000, it declined to 16.95% among the urban population (Fig. 3).

With the reduction in the domestication of cattle and migration towards cities, the consumption of packed dairy products has been increasing. According to the National Sample Survey of Consumption Expenditure between 1983 and 2009–10 their share in the monthly per capita food expenditure increased from 11.5 to 14.9 % in rural areas and from 15.7 to 18.4 % in urban areas [17]. A study by Kumar A et al. revealed that the per capita consumption of milk has increased from 44.7 in 1983 to 57.1 kg in 2009–10. The demand for milk was found to increase at a faster rate in urban areas compared to rural areas. They concluded in their study that increasing urbanization would further fuel growth in the demand for dairy products [18].

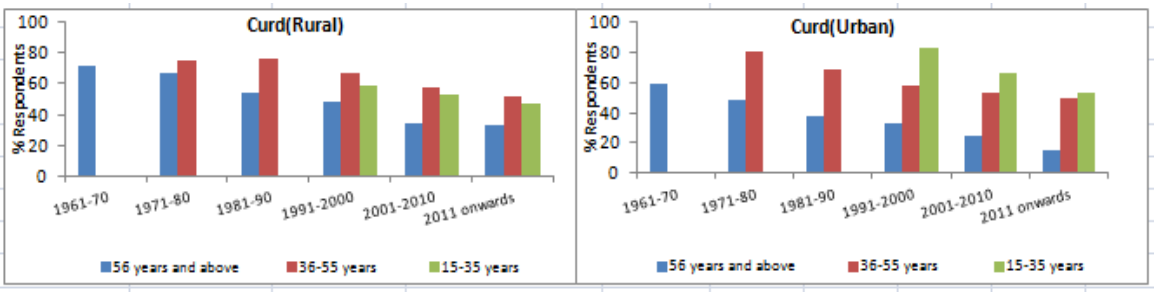

Fig. 2. Consumption trends for Curd (routinely/daily)

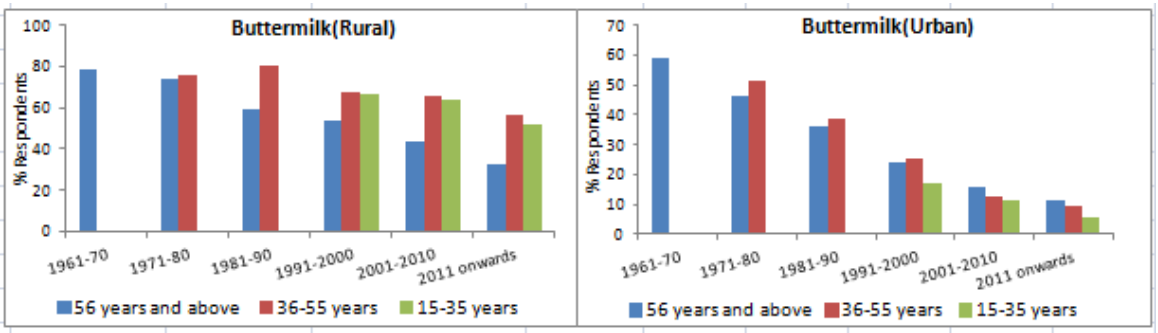

Fig. 3. Consumption trends for buttermilk (Routinely/Daily)

3.4 Consumption Trends for Homemade Butter/Ghee (Routinely/Daily): Decade wise Represented as % of Population

In the rural areas, there is a practice of preparing curd, buttermilk, and *ghee* almost on the daily from the milk produced by the cattle. As the production of milk decreased, production of homemade *ghee* too observed a drop in both production and consumption. The daily consumption of ghee was 89.90% (rural) and 76.48% (urban) in 1961-70 to 43.56% (rural) and 28.30% (urban) after 2011. Similar trends were shown by the other two age groups (Fig. 4).

He Y et al. reviewed the consumption of meat and dairy products in China. The study revealed that the frequency of dairy intake among the Chinese population decreased with aging. Compared with other age groups, the population under age 18 years had the highest frequency of milk intake in China [19].

3.5 Consumption trends for Paneer/ Indian Cottage Cheese (Fortnightly): Decade wise Represented as % of Population

The consumption frequency was quite low as compared to other milk products as it was not prepared at home and neither purchased (especially in rural areas) during earlier decades. However, with the passage of time, it has become popular among young generations. *Paneer* was mostly purchased, then cooked in the form of curry and hence consumed. Rural areas show an insignificant consumption (especially during earlier decades), primarily because of lesser availability and high market price. *Paneer* is chiefly popular among 15-35 years of age group with the rise in consumption from 66.56% in 1991-2000 to 89.32% after 2011 (Fig. 5).

Kubicová L et al. compared the consumption of milk and dairy products with recommended intakes resulting from the rationalization of diet in the population of the Slovak Republic. They stated that the consumption of milk and dairy products was insufficient at the level of 70% of the recommended consumption intakes of the selected food group. Participants preferred drinking milk, cheese, and yogurt, however, consumption is still low, which was attributed to the high prices of the products as compared to their income [20]. Melesse K et al. reported in their study that in the majority of the households, especially the medium and low-income groups, there was a decreasing trend of milk products consumption due to the increasing trend of the price of milk and milk products [21]

The results from the study done by Kubicová L et al. concluded that the main factors determining the consumption of milk and dairy products include quality, composition, price, durability, and nutrition data [22]. In a survey conducted by Melesse K et al, they concluded that consumption levels of milk and milk products were significantly correlated with household income, consumer unit (family size) education level of the food budget manager (FBM), age of the FBM, location of the household, ownership of dairy cattle, monthly expenditure on dairy products, average daily milk production per household and price of milk products [23]. Agrawal S et al., observed in their study that compared to children from the poorest households, those from the richest households were more likely to consume fortified baby food, juice, yogurt, tinned powdered/fresh milk, formula milk, cheese, yogurt other milk product, and mangoes, papayas, Vitamin A fruits. Higher maternal education was relatively more strongly

associated with consumption of essential food items and all food groups, but household wealth was found to have a significant influence on the intake of the dairy group only [24].

According to Marangoni et al, milk and its derivatives contribute essential micro and macronutrients to the diet, when consumed according to appropriate national guidelines, especially in infancy and childhood where bone mass growth is in a critical phase. They suggested in their review that, appropriate consumption of milk and its derivatives may be beneficial at all ages, with the exception of specific medical conditions such as lactose intolerance or milk protein allergy [25]. Milk consumption patterns and perceptions in the Korean population were studied by Park J. The results showed that the main reasons for consuming milk by age groups were height growth (30.7%) for adolescents, as a meal substitute (34.8%) and bone health (25.7%) for adults, and bone health (59.6%) for the elderly [26]

There is a growing change in the food market in the world, especially in developing countries. This change is based on the increase of consumers standards of living, which are factors that affect the changing lifestyles and worldwide trends in consumption. Regarding milk consumption, it is important to find the association between personal and environmental factors with the intention to consume milk and the decisions and strategic planning that milk business enterprises have for expanding their business [27]. According to the report by Kumar A, the estimated demands for milk and milk products will probably rise by 2026–27 and will put India under constant pressure to maintain the existing growth in milk production. Any deceleration in the growth of milk production will jeopardize Indias ability to meet its domestic requirements for milk in the long run [28].

Indian diets and national subsidy programs are biased towards cereals, offering only limited quality protein. Promoting appropriate levels of production and consumption of high-quality foods rich in protein is critical in Indias attempts to enhance diet quality and resolve stubbornly high levels of under-nutrition. Overall, to achieve enhanced dietary quality in the coming decades agricultural and other food policies need to shift from cereals only focus, to a stronger investment in pulses, dairy, and egg production. Assuming that imports will not dramatically increase, domestic agricultural and animal husbandry policy measures are required to increase the productivity and output of these foods [29].

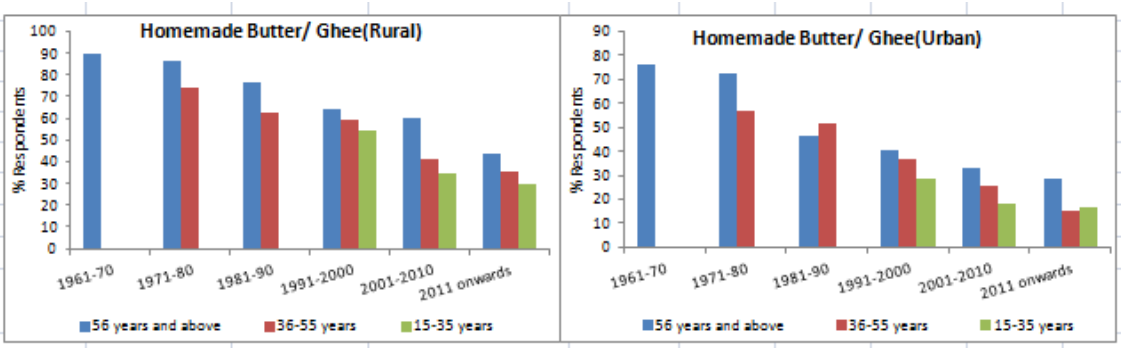

Fig. 4. Consumption trends for Butter/*Ghee* (Routinely/Daily)

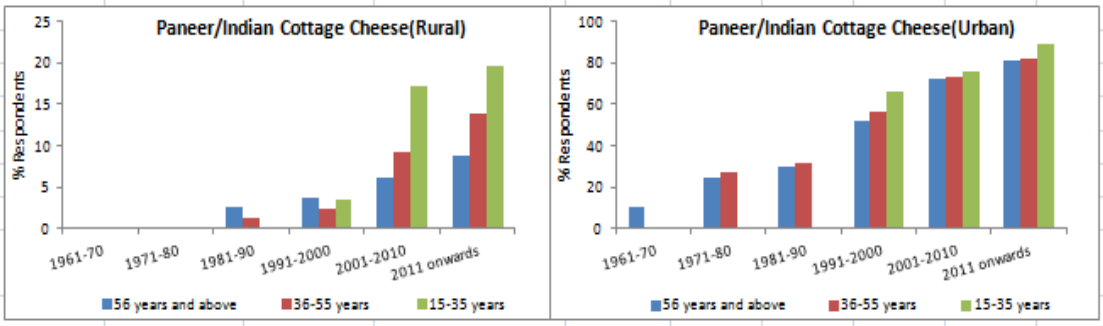

Fig. 5. Consumption trends for Paneer/ Indian Cottage Cheese (Fortnightly)

4. CONCLUSION

This study in Uttarakhand (India) presents a picture of how urbanization and changing lifestyles pose an impact over the fashion in which milk and milk products are consumed. There has been a massive switch towards the market-produced milk products from once home-produced milk and milk products. During earlier decades, milk was consumed daily by the majority of the population 94.38% (rural) and 92.45% (urban) depending upon the fact that it was produced by the domesticated cattle and easily available. However, a high frequency of daily consumption was observed among the 15-35 years of age group, though it was more of purchased from store or dairy. Curd, however, was earlier prepared by milk produced at home, now mostly prepared at home by the younger age groups from milk bought from store or dairy. The consumption of homemade milk products like buttermilk and butter/ghee was greatly reduced. The practice of preparing these milk products daily from the milk produced by domesticated cattle was experiencing a great drop, especially in the rural areas of Uttarakhand. Paneer (Indian cottage cheese) has got popular in the past few decades, especially among the younger age group. Though, its consumption was highly dependent upon the location and economic condition of the household.

The region has observed a considerable decline in the consumption of the home-produced form of these products. The probable reasons reported by the residents being urbanization, migration of younger generation towards cities, and commercialization of the commodity. From the revival point of view, cattle rearing and dairy farming should be promoted for the production and consumption of home-produced healthy products from milk. Migration could be controlled by providing employment opportunities and promoting local businesses in the rural hilly areas. Along with this, implications for policymakers include making people aware of dietary requirements of milk and milk products during various life stages.

5. LIMITATIONS OF THE STUDY

These findings may be restricted by the social desirability bias. The survey tool i.e. the questionnaire could also pose certain limitations as the dietary recall is dependent on the memory, literacy, and numerical skills of the respondent. Also, due to time constraints, the sample size of this study was restricted and the area of study was limited.

ETHICAL APPROVAL

As per the institutional human subject committee, survey-based non-interventional studies are exempted from approval.

CONSENT

The study involved interviewing the subjects. Before interviewing, verbal consent from the subjects was taken; their identities were not disclosed and were kept anonymous. As per the institutional human subject committee, survey-based non-interventional studies are exempted from approval.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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