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Nutritional Status of Camel Milk Consumers in Bikaner District of Rajasthan, India

Research Article

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Abstract

In present investigation nutritional profile of 100 camel milk consumers and 100 non camel milk consumers in the same age group (30-50yr.) residing in similar rural area of Bikaner District of Rajasthan, India was assessed. All the subjects surveyed were interviewed on the basis of purposive sampling to find out their nutritional status. Consumption of camel milk was found to be highest (100 percent) by the adults and elderly. All the subjects were consuming camel milk due to its easy availability, therapeutic values and traditional household practice. Both the groups were assessed for Clinical, Dietary intake and Anthropometric measurement. Significant gender difference was observed in camel milk intake in both the groups.

Keywords: Camel milk; Nutrition; Dietary Requirement; Milk consumers

Introduction

Camel as a livestock plays an important role in desert ecosystem and its milk has potential contribution in human nutrition in the hot and arid regions of the world. This milk contains all the essential nutrients as found in other milk. Fresh and fermented camel milk has been used in different regions in the world including India and Russia for human consumption as well as for treatment of a series of diseases.

Camel milk is used extensively within a variety of populations for its proposed healing properties and disease prevention mechanisms [1]. Some of the more common indications associated with its use include diabetes, allergies, immune disorders, and cancer [2,3]. It is also advocated as an alternative to cow's milk for those who are allergic or intolerant to cow milk proteins [4]. In the last few years, awareness about nutritional and medicinal benefits of camel milk has rapidly increased [5]. Consequently, the demand of the product has also increased. Camel has always been the symbol of India's state of Rajasthan and traditionally represents the lifeline of the rural population. The camel possesses a huge productive potential. It is a multi- purpose animal and, unlike any other domesticated animal, has been utilized by humans for centuries for transport, traction power, milk, meat, skin and fuel.

In India camel milk is being used since long by the camel keepers for the preparation of traditional milk products such as local sweets (Kheer, Ghevar), Tea, Coffee and raw or boiled milk for drinking purpose in rural arid areas. Rajasthan is a state where due to extreme hot environment and scarcity of water, conditions do not support the dairy cow, hence camel milk can play a very important role in the diet of the people living in this state.

Although various studies have been conducted on the nutritional status of different age groups with different criteria but information regarding the nutritional status of camel milk consumers is lacking in the literature. People in Bikaner district also represent a definite

social sector with different food habits which in turn might affect their nutritional status. Similar may be the case for camel milk consumers. Therefore, the aim of the study is to study the nutritional status of milk consumers in nearby areas in Bikaner District of Rajasthan.

Materials and Methods

The present study was conducted in nearby villages of Bikaner district of Rajasthan, selected on the basis of existing camel population. Community was surveyed to explore consumption pattern of camel milk and its impact on their nutritional and health status.

Accordingly, a survey was conducted on consumers of camel milk (experimental group subjects n=100) and those who do not consume camel milk (control group subjects n=100) but all residing in the same village. Further the male and female subjects were equally represented in both the groups. A structured interview schedule was developed to collect information about different aspects of camel milk consumption from both the groups.

Other information about the camel milk, like total availability of milk, seasonal availability, reasons for consuming and not consuming, preference for it in the family, frequency of consumption, and types of camel milk processed products and its therapeutic value as obtained from the experimental group i.e. camel milk consumers was also collected. However, the control group i.e. non consumers of camel milk were also asked for their reasons for not consuming it. Each such aspect is dealt separately as follows.

Survey of the community

Camel rearing community "Riakas" residing in nearby villages like Bhamatsar, Gadhwala, Kanasar, Morkhana, Palana and Udasar of Bikaner district were visited frequently to explore the camel milk consumers. A list of regular camel milk consumers in the age group of 30-50 years was prepared, since occurrence of the most of the noncommunicable chronic diseases is common after 40 years of the age [6]. A sample of 100 subjects of regular camel milk consumers from the list was selected randomly [7]. Similar number of non-camel milk consumers in the same age group residing in similar rural areas was also identified to serve as control subjects. The experimental and control subjects were then contacted and interviewed to explore the consumption pattern of camel milk and their nutritional status. Subjects' interest and their willingness to cooperate in the study were considered prior to their selection.

Data collection

General information about the subjects

This included information regarding their name, age, sex, education, address, food habits, types of family, total income, activity pattern, health status and availability of camel milk. Age of the respondents was defined as the number of years completed by the respondents at the time of interview. Age range of the respondents was between 30-50 years.

The type of family i.e. joint or nuclear was noted. According to Bhushan and Sachdeva [8], a family is which consist of husband, wife or wives and their children are called nuclear family. The children leave the parental household as soon as they are married. A nuclear family is an autonomous unit free from the control of the elders while joint family is viewed as a merger of several nuclear families. Thus a small joint family may include an old man and his wife, their son, son's wife and their children. There are two nuclear families and the son being a member of both families.

Occupation and Income

Occupation is any kind of job the respondents were doing as their earning sources and were noted for all their family members.

Income was assessed as total earning in terms of money during a specific period of time. In the present study income from other sources like agriculture, poultry, house rent, interest etc. was also noted. On the basis of the total family income the selected subjects were classified into three different economic groups i.e. Lower Income Group (LIG) having income less then Rs.12,000, Medium Income Group (MIG) having income Rs. 12,000 to Rs.20,000 and High Income Gruop (HIG) having income more than Rs.20,000 as per norms given by Govt. of Rajasthan, Urban Development.

Consumption pattern of camel milk

To gather information about consumption pattern of camel milk following questions were asked to each of the subjects:

Questions related to various methods of using camel milk and its value addition.

- a. Questions seeking answer about reason for consuming camel milk including its therapeutic values.
- b. Questions seeking information about the effect of consuming camel milk on their health as perceived by them.
- c. Question seeking information about reason for non consumption of camel milk.

Nutritional and health status of the subjects

Nutritional and health status of the experimental and control subjects were assessed by Dietary intake, Anthropometric measurement, and Clinical assessment.

Dietary intake

To find out dietary status, the food intake of all the selected subjects of the study was assessed by following method:

The food intake of the subjects was assessed by 24 hours recall method for three consecutive days using standardized food cup set. Raw quantity taken for cooking as well as cooked quantity prepared especially for the subjects or for the whole family and consumed by the subject was recorded to find out the quantum of raw food intake. Raw and cooked amount were quantified either in terms of house hold measures (standardized cup set) by weight or number. From this cooked and raw amount consumed by each subject was calculated and food adequacy was determined by using the following formula:

Food adequacy (%) = Mean intake/ Suggested intake X 100

In this formula suggested intake is the recommended dose of daily allowances (RDA) by ICMR. Intake of various foods consumed by the subjects was estimated and food frequency ratio was calculated then

compared with that of the balanced diet as given by ICMR (2010) for moderate working adults.

Anthropometric measurement: It provides information on gross body size, skeletal form or configuration and on skeletal and soft tissue development. These measurements are non invasive, inexpensive, universally acceptable and can reflect nutritional and health status. Each of the subjects was assessed for the height, weight, waist circumference and hip circumference to find out their Body Mass Index [9] and Waist Hip Ratio [10].

Clinical examination: It is an important practical method for assessing the nutritional status of a community. This method is based on examination for changes related to inadequate nutrition which can be seen, felt is superficial epithelial tissues, especially the skin, eye, hair and buccal mucosa, or in organs near the surface of body such as the parotids and thyroid glands.

Every individual subject was examined for the signs of nutritional deficiency and observations were recorded in the schedule. The interpretation of clinical signs was done as recommended by Jelliffe [11] and Gibson [12].

Statistical Analysis

Observations collected on the various aspects of the study have been statistically analyzed as suggested by Gupta [7].

Results & Discussion

Information about community survey

A community survey of 100 households associated with camel rearing in the villages of Gadhwala, Bhamatsar, Udasar, Sainsar, Palana, Morkhana and Kanasar in Bikaner district was carried out to gather information about the pattern of consuming camel milk. Similar numbers of the non-consumers of camel milk from same villages were also surveyed.

Among these villages Ghadwala village was an important study point. Since the village harbors maximum number of the she camels as well as the inhabitants of the village had preference for consumption of camel milk. The village is dominated by community of Raika who are known to rear camel either for milk or for transport purpose. The total camel milk production in the village is about 100-120 kg per day.

Following aspects were dealt with while conducting the survey:

General information about the subjects

The general information of the subjects of control and experimental groups about their age, sex, type of family and family income was collected (Table 1).

The selected subjects were aging between 30-50 years. Perusal of data reveals that the majority of cases (68 percent) who consume camel milk belonged to age group 41-50 years, followed by 31-40 years (32 percent). Same age groups of the non-consumers (control group) were also surveyed. The results illustrate that the camel milk is preferred by old aged persons as compared to their younger counterparts.

Specific information about consumption of camel milk

Each such aspect about camel milk consumption is dealt separately as follows.

Availability of camel milk: The information about the total availability of camel and camel milk was obtained from the respondents of the identified village (Gadhwala).

Perusal of data reveals that the total number of camels available in the studied villages was 316 of which she camels were only 185. Further analysis of data reveals that only 80 she camels were in the lactation state in the villages and an average yield of camel milk per day per camel was 6 litres.

Seasonal availability of camel milk: Information about the seasonal availability of camel milk was gathered and is presented in Figure 1.

The seasonal availability of milk from her camel seems to be controlled by the availability of feed and fodder and its seasonal nature of breeding [13].

Reasons for consuming camel milk: While inquiring about reasons for consuming camel milk, all of the subjects reported about its therapeutic values, traditional/ household practice, easy availability and its good taste. The other factors favoring camel milk consumption included its high nutritive value (70 percent) and low cost (68 percent) (Figure 2).

All the respondents (100 percent) reported that camel milk is useful in improving the appetite, helps in maintaining good health and useful in diabetes. Majority of the respondents (70 percent) were of the opinion that camel milk helps in the bowl movement but only

Table 1: General information about the subjects.

General i	nformation	Experimental subjects (n=100)	Control groups (n=100)	
Age	30-40 yr.	32	32	
	40-50 yr.	68	68	
Sex	Male	50	50	
	Female	50	50	
	Joint	89	78	
Type of family	Nuclear	11	22	
	LIG <12,000/-	78	61	
Total family income	MIG 12,000/- 20,000/-	21	35	
	HIG <20,000/-	1	4	



17 percent and 8 percent of them reported that camel milk is useful in digestion and control of blood pressure, respectively. Yet 5 percent also were of opinion that it is beneficial in preventing liver diseases. The result clearly reveals that as per consumer's belief camel milk bears good therapeutic value.

Therapeutic value of camel milk as perceived by the subjects: : During the survey the respondents were also asked about their knowledge about therapeutic value of camel milk. The data thus generated is presented in Figure 3.

According to data, all the respondents (100 percent) reported that camel milk is useful in improving the appetite, helps in maintaining good health and useful in diabetes. Majority of the respondents (70 percent) were of the opinion that camel milk helps in the bowl movement but only 17 percent and 8 percent of them reported that camel milk is useful in digestion and control of blood pressure, respectively. Yet 5 percent also were of opinion that it is beneficial in preventing liver diseases. The result clearly reveals that as per consumer's belief camel milk bears good therapeutic value.

Preference for camel milk in the family: The subjects were interviewed about their preference for camel milk in their families. Highest consumption of camel milk was found among adults and elderly (100 percent) followed by adolescent (94 percent) and children (92 percent).

It was evident from the present study that adults and elderly members of the community preferred to take camel milk as compared to their younger counterparts (Figure 4). This may be because of their traditional practice of consuming camel milk and secondly they might be aware of the therapeutic value of the camel milk. Osman [14] has





Soni V, et al.

conducted study on utilization of camel milk by milk consumers in Sudan and observed that the majority of owners consumed the produced milk, while few of them sold the produced milk and took the milk for calves.

Frequency of consumption of camel milk: The subjects of study group were interviewed for the frequency of consumption of camel milk. All the camel milk consumers reported that they consume camel milk daily in its fresh form i.e. without boiling although the preference depended on their age groups.

Forms of using camel milk: The form of using camel milk and its types of processed products being utilized in diet of the subjects were surveyed. All the households studied were found to be utilizing camel milk either in the form of fresh milk or in processed form or both.

It has been observed that the camel milk was found to be processed for preparing various products viz tea (100 percent of subjects), kheer (100 percent of the subjects) and raabri (100 percent of the subjects). None of the household utilized camel milk in the form of khoa, curd, ice cream and paneer or other forms of value added products.

Reasons for not consuming camel milk: The respondents of control group who do not consume camel milk were interviewed for the reasons of their non consumption. "Uncommonness of camel milk" was the reason reported by majority of the (82 percent) respondents. This was followed by "odd flavor" which was reported by 46 percent of the subjects. The other reasons like "salty taste" and "unavailability" was reported by 30 percent and 24 percent of the respondents, respectively (Figure 5).

Assessment of nutritional status of the subjects





Nutritional status refers to the health of an individual as it is affected by the intake and utilization of nutrients [15]. Thus nutritional status of the subjects was evaluated by assessing their dietary, anthropometric and clinical status.

Dietary assessment: The food habits of the subjects was evaluated and it was found that irrespective of age and sex, all respondents from experimental and control groups were vegetarian.

However, besides economic status, the type of menu incorporated for the day's meal was depended upon individuals like and dislike, food habits, food availability and family food pattern.

Nutrition is the most vital component of life that is to be taken care of by all individuals to maintain their body structure and energy levels for day to day activities. During adult age, balanced amount of nutrients are needed to support the development as well as to meet the balanced basal metabolic rate [16].

The dietary adequacy of the subjects under present study was assessed by calculating the amount of various foods and compared with balanced diet suggested by ICMR [17,18]. The relevant results are presented in Table 2 &3.

Among male and female subjects, mean cereal intake of experimental group as well as control group was significantly higher than the balanced diet recommended by ICMR [17] while in pulses it was noted to be lower in both experimental and control groups as compared to balanced diet recommended by ICMR [18] in male and female subjects. All subjects were not fulfilling the requirement of recommended value for pulses in their diets.

Mean intake of green leafy vegetable was apparently very low by the male and female subjects of both the groups as compared to the value suggested in balanced diet. The lower intake of green leafy vegetable by the subjects of present study in Thar area may be due to unavailability, food preferences and unawareness about its importance. Similar finding were noted by Paul and Purushothman [19] while conducting study on dietary intake of LIG subjects under their study. In the present study potato, onion and radish were the most commonly consumed roots and tubers in the form of vegetables and

Another group covers liquid milk, milk powder, fermented products like curd, butter milk etc. Milk has a unique place in any balanced diet particularly in a vegetarian diet to provide good quality protein, sufficient calcium and riboflavin, which are difficult to obtain in adequate quantities solely from plant foods [17]. According to Ostman et al [20] milk and milk products tend to lower post prandial glucose level and fermented milk and milk products are more beneficial in maintaining blood glucose level.

salad by the subjects in both the groups.

A vast difference occurred in milk intake at two levels. Firstly a clear gender difference is visible in the milk intake by both the groups. Since, the female subjects of control and experimental groups were consuming only 60.46 ml to 105.26 ml of milk per day as compared to their male counterparts who were having 100.6ml to 250.62 ml of milk each day. Moreover at the time of survey it was also observed that most of the milk consumed by the female subject was in the form of tea and buttermilk.

Similarly the difference in milk intake was also observed when it was compared between males of both the groups. The male subjects of experimental group were consuming quite good amount of milk (250.62ml/day) than that of the males belonging to control group (100.6ml/ day). This must be due to ready to use availability of camel milk in their houses for experimental group. It was also reported by camel breeders that camel milk available with them is not allowed to be sold in the market as per their religion. This might have led to higher consumption of camel milk within their family. The interest for camel rearing and production is increasing strongly for the last 20 years in many countries, including Western countries where the camel is newly implemented. As example, the implementation of camel dairy farms in Netherland, Italy, USA or even in Australia testifies the growing enthusiasm for the camel products, especially milk [21].

14	Experim	ental grou)	Control group (n=50)				
items	Mean food intake	±S.D.	B.D.	Percent B.D.	Mean food intake	±S.D.	B.D.	percent B.D.
Cereals (g)	547(450-595.45)	41.25	480	113.95	551.48 (500.25-600.35)	33.4	480	114.79
Pulse (g)	23.82 (18.40-28.60)	2.48	90	26.46	24.95 (20.87-30.25)	3.1	90	27.72
Green Leafy Vegetable (g)	28.21 (20.50-35.50)	4.21	100	28.21	29.92 (25.30-35.10)	3.68	100	29.92
Roots & tubers (g)	152.2 (98.60-200.10)	7.21	200	76.1	154.45 (100.40-200.10)	6.2	100	77.22
Milk & milk products (g)	250.62 (200.10-450)	32.73	300	83.54	100.6 (50.50-200.25)	24.21	300	33.35

Table 2: Mean food intake of the male respondents (n=100).

B.D. - Balanced diet [17], Note - Figures in parenthesis indicate lower and upper limit of food intake.

Table 3:	Mean food	intake of the	female responder	nts (n=100).
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ltomo	Exper	imental group (n=50)	Control group (n=50)				
nems	Mean food intake	±S.D.	B.D.	%B.D.	Mean food intake	±S.D.	B.D.	%B.D.
Cereals (g)	414.96 (354.77-490.75)	36.33	360	115.26	425.33 (350.40-500.10)	31.22	360	118.14
Pulses (g)	18(15.50-21.80)	2.19	75	24	17.34 (15.20-20.60)	3.6	75	23.12
Green Leafy Vegetables (g)	27.86(22.40-30.90)	3.6	100	27.86	29.35 (25.10-30.05)	3.4	100	29.35
Roots & tubers (g)	151.47(100.10-200.30)	4.4	100	151.47	150.34 (95.50-200.30)	3.8	100	150.34
Milk & milk products (g)	105.26(50.90-250.20)	30.91	300	35.08	60.46(30.50-150.50)	18.4	300	20.15

B.D. - Balanced diet [17], Note - Figures in parenthesis indicate lower and upper limit of food intake.

Immaterial of gender and types of group overall view of food intake indicates that the diets of all the subjects was grossly lacking in important food groups like pulses, green leafy vegetables and milk. Whereas, energy and carbohydrate rich foods like cereals were found to be consumed in more than the required amounts. Gopalan et al [22] have reported that in rural areas, a normal adult person consumes 446 g cereals/millets, 32 g pulses, 10 g green leafy vegetable, 48 g other vegetables, 70 g milk, 11 g fish and such foods etc.

Anthropometric assessment: Anthropometric measurement is an important method assessing the nutritional status of the subjects as these measurements are partially dependent upon nutrient intake. Therefore, in present study weight, height, waist circumference and hip circumference of all subjects were measured and then Body Mass Index (BMI) as well as Waist Hip Ratio (WHR) of the subjects was assessed using pertinent standards as mentioned in methodology.

Height

During present study the mean height of male and female subjects of control and experimental groups was measured to be 176.34 cm and 176.32 cm, 158.68 cm and 158.60 cm, ,respectively and the values were in tune with the reference values of Indian man (173 cm) and woman (161 cm) given by ICMR [17]. The difference between the height of control and experimental subjects of both the genders was found to be non significant.

In contrast to the present results, Banerjee et al [23] reported evidence of lower weight (79-95 percent) and height (81-97 percent) than the given standards in their investigations on male and female subjects of various age groups.

Weight

Body weight is most widely used and the simplest reproducible anthropometric measurement for the evaluation of nutritional status

Table 4: Distribution of subjects according to their mean height and weight.

Soni V, et al.

of the subjects. It indicates the body mass and is a composite of all body constituents like water, minerals, fat, protein, bone etc. for screening short term malnutrition at a high level of specificity, weight for height is superior to weight for ages [24]. Difference in the weight measurement of both the categories of control and experimental groups between male and female subjects were found to be non significant. It may also be perceived from the table that weight of all the subjects was approximately near to the reference values. It must be due to their moderately active life style as well as almost balanced energy intake.

Body Mass Index (BMI)

BMI provides a reasonable indication of the nutritional status of adults. The BMI has good correlation with fatness. It may be used as an indicator of chronic energy deficiency as well as obesity [25].

None of the subjects were found to be in obese grade III and II categories. Similar evidence of BMI was observed by [26,27] during their investigations on adult male and female subjects. It is important to note that majority of the subjects (77- 83 percent) in both the groups were belonging to normal BMI category. This must be due to their better intake of energy and protein rich foods in their diet.

Waist Hip Ratio (WHR)

The distribution of excess adipose tissue profoundly affects its role as a risk factor for Cardio Vascular Disease (CVD). Specially, excess of truncal and intra-abdominal fat (central obesity) have important adverse influence on lipid levels, blood pressure, glucose tolerance and is in fact risk factor for coronary disease [28,29].

The mean WHR of the male subjects belonging to control and experimental category was noted to be 0.887 and 0.886, respectively (Table 5,6). Similarly the values were noted to be 0.774 for their female counterparts against 0.80 as reference value. The difference between

		Male St	ubjects			Female			
Parameters	Suggested values	Control Experimental		t-Value	Suggested values	Control	Experimental	t-Value	
Height (cm)	173	176.34 ±3.160	176.32±3.248	0.031	161	158.68±4.940	158.60 ±3.977	0.089	
Weight (kg)	70	69.38 ±6.487	67.56 ±5.758	0.484	55	53.98 ±4.497	54.02 ±4.295	0.068	

Table 5: Distribution of subjects according to their mean BMI and WHR.

	Male Sub		ubjects				Female Subjects	
Parameters	Suggested values	Control	Experimental	t-Value	Suggested values	Control	Experimental	t-Value
BMI (kg/m²)	18.50 ±24.99	22.22 ±1.579	21.70 ±1.395	1.88	18.50 ±24.99	21.377 ±1.526	21.473±1.545	0.31
WHR	0.95	0.887 ±0.178	0.886 ±0.021	0.30	0.80	0.774 ±0.018	0.774 ±0.020	0.10

The mean values of BMI indicate that the subjects were having normal BMI when compared with reference value (18.5-24.99 kg / m²).

Classification Anthro pometric indices Percentage of the experimental subject Percentage of the control subjects Male (N=50) Female (N=50) Total (N=100) Male (N=50) Total (N=100) Body Mass Index (kg/m²) Female (N=50) <18.5 Under weight 10 (05) 14 (07) 12 (12) 18(09) 15(15) 12(6) 18.5-24.99 Normal 84 (42) 80 (40) 82 (82) 76 (39) 75 (38) 76 (77) 25.0-25.99 Over weight 6 (03) 4 (02) 5 (05) 8 (04) 6 (03) 7 (07) 26.0-29.99 Pre -obese -2(01) 1(01) 4(02) 2(01) 3(03) 30.0-34.99 Obese grade I 2(01) ----35.0-39.99 Obese grade II -----≥40 Obese grade III -----

Table 6: Body Mass Index classification of the subjects.

Classification devised by WHO Expert Committee [9] of Rajasthan.

Table 7: Waist Hip Ratio classification of the subjects.

Anthro pometric indices	E E	Percenta	ge of the experimer	tal subject	Percentage of the control subjects			
Waist Hip Ratio	Classificatio	Male (N=50)	Female (N=50)	Total (N=100)	Male (N=50)	Female (N=50)	Total (N=100)	
Male < 0.95	Normal	96 (48)	-	48 (48)	94 (45)	-	45 (45)	
≥ 0.95	High	4(02)	-	2 (02	10(05)	-	5 (05)	
Female < 0.8	Normal	-	82(41)	41(41	-	76(38)	38(38)	
≥0.8	High	-	18(09)	9(09)	-	24(12)	12(12)	

Classification devised by WHO Expert Committee [9].

Table 8: Distribution of the subjects according to the percentage prevalence of various clinical signs

	Percentage of the subjects							
Clinical sizes and symptoms	Experime	ental subjects	Contro	ol subjects				
Clinical signs and symptoms	Male (n=50)	Female (n=50)	Male (n=50)	Female (n=50)				
	30-50 years	30-50 years	30-50 years	30-50 years				
		Hair						
Lack of luster	10 (5)	20 (10)	8(04)	24 (12)				
Thinness and sparseness	2(01)	6 (03)	8 (04)	8 (04)				
Dys pigmentation	2 (01)	6 (03)	2(01)	8(04)				
	I	Face						
Naso-labial dyssebacea	-	2 (01)	-	4 (02)				
	E	Eyes						
Pale conjunctiva	4 (02)	08 (04)	8 (04)	16 (08)				
Bitot's spot	-	02 (01)	-	02 (01)				
		Lips						
Chilosis	-	2 (01)	8 (04)	4 (02)				
	Тс	ongue						
Edema of tongue	-	02 (01)	-	04 (02)				
Atrophic papillae	-	02 (01)	-	04 (02)				
	Т	eeth						
Pale	20 (10)	12 (06)	24 (12)	14 (07)				
Missing	4 (02)	02 (01)	4 (02)	04 (02)				
Gums								
Pain in gums	8 (04)	12 (06)	10 (05)	18 (09)				
Bleeding in gums	2 (01)	4 (02)	2(01)	6 (03)				
	1	Vails						
Koilonychias	-	-	-	02 (01)				

Value in parenthesis is indicates the number of subjects

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the male and the female subjects of both the categories was found to be non significant. The data regarding WHR measurement of all the subjects also indicate that they had slightly lower mean WHR when compared with the reference values. Agarwal et al, [30] also have reported approximately similar WHR values (0.85 and 0.88) for male and female rural adults of Rajasthan.

When subjects were classified according to their categories of WHR (Table 7,8) it indicates that majority of the subjects were falling in normal category but few of them had high waist hip ratio.

Clinical examination of the subjects

Clinical examination is an important method of assessing the nutritional status of community. In this, the subjects were examined for change in the appearance related to inadequate nutrition. The clinical signs observed were interpreted as the schedule suggested by Jelliffe [11].

No significant difference was observed of clinical signs in both the groups under study-compared with earlier drought survey of Jodhpur district, it was observed that prevalence of various signs related to protein calorie malnutrition, prevalence of anemia, vitamin A, vitamin C deficiency and B complex deficiency was observed to be also higher in that area [31].

In summary, nutritional profile of milk consumers and non camel milk consumers was assessed in present investigation. Most of the subjects were from joint family. Average yield of camel milk per day was found to be 6 liter. Consumption of camel milk was found to be highest by the adults and elderly. All the subjects were consuming camel milk due to its easy availability, therapeutic values and traditional household practice. Finding of food intake it was noted that pulses, green leafy vegetables and milk and milk products were inadequately consumed by all the subjects, whereas consumption of cereals, roots and tubers were noted to be in adequate when compared with suggested intake given by ICMR [18].

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