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Comparative study of the Nutritional and Health Status of Goat Rearing and Non-Goat Rearing families

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Abstract

Goat raising is one of the important agricultural enterprise particularly in rural parts of this country and have proved very useful to man throughout the ages, largely because of their adaptability to varying environmental conditions under which the breeds and strain types have evolved and in which they are maintained. Milk samples (100 ml) from Goat and Non Goat Rearing Families were collected at fortnightly intervals from the pooled milk from all the selected villages. 12 subjects suffered twice in a year rest once in a year. Out of 40, GR families in villages surveyed we found, on an average they took bath daily in summer and once or twice in a week in winter while women washed their hair on alternate day or twice a week in summer but once in a week in winter. Only 4-5 families used to process milk into paneer while almost 62 per cent of the NGR families used to convert milk into curd. The analysis of the data revealed that the value of energy was significantly higher in male sex than to female sex in goat, cow and buffalo milk drinking families. There was no difference in value of energy in family members within the sex. The study indicated that the buffalo rearing families were economically better than the goat rearing families. Due to higher fat and protein content in buffalo milk, the health status of the females taking buffalo milk was sound. However, the health status of the females taking goat and cow milk were at par with respect to nutrition components. Twenty subjects of NGR families suffered four times in a year, 10 suffered thrice in a year and rest suffered frequently. NGR respondents availed health services both from private clinics and government hospitals/ dispensaries.

Key words : Nutritional & Health Status of Goat, and Non-Goat Rearing families

Inroduction

Goat rearing occupies an important place in the economy of desert districts as it provides livelihood to lakes of goat breeders. Goats are multi-purpose animals, producing meat, milk, skin and hair. Their primary function is meat production, although in temperate countries milk has become of greater importance; skins are a valuable by-product, especially in those countries with large goat population. Goats, cattle and buffaloes population in the world is 921, 142.8 and 194 million, respectively, and India possess 16.71 per cent of the world's goat population (FAO, 2011). The annual growth rate of goat population in India is about 3 % in spite of high slaughter rate (46%). Goats contribute to the national economy about Rs.1, 000 crore annually (about 5% of agricultural GDP) besides providing the livelihood and nutrition to the millions of resource less and under

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privileged malnourished population (Sharma et al. 2009).The per capita milk consumption in the world and in India is 284 and 191g / day respectively (Figures may be checked) (FAO, 2011). Goat milk is being consumed by the goat rearing families, which are resources poor and generally suffer from malnutrition due to the lack of resources, illiteracy and lower employment opportunities. Goat is often termed as the "Poor man's cow" and at village level, goats play a very important role in food chain, employment and in overall livelihood. It has distinct social, economical, managerial and biological advantages over other livestock species (Acharya and Singh, 1992). The nutritional and health benefits of goat milk are related to a number of medical problems, foremost being food allergies with cow milk proteins. Goat milk showed unique nutritional differences in smaller fat globules, in different milk proteins polymorphisms and in higher contents of short and medium chain, mono and polyunsaturated fatty acids, triglycerides in milk fat, all contributing to easier digestion in humans and used as therapeutic nutrient in male absorption syndrome, and infant feeding. (Babayan, 1981; Haenlein, 1992)

Material and Method

Collection and Analysis of Milk Samples

Milk samples (100 ml) from Goat and Non Goat Rearing Families were collected at fortnightly intervals from the pooled milk from all the selected villages. Milk samples were collected individually from the lactating families both for morning and evening milking and later pooled in proportion to their yield for each species and processed for analysis. Milk samples were collected aseptically in thoroughly cleaned bottles and brought to the laboratory for the estimation of milk composition.

Analytical Procedures

Milk samples were analyzed for fat, solid-not- fat (SNF), lactose and protein using Ultrasonic Milk Analyzer (LACTOSCAN LA). Total solids content in milk was calculated by addition of fat and SNF contents. Total ash and minerals viz. Calcium and Phosphorus were estimated.

Physical and Physiological Attributes of GR and NGR Families

The anthropometrical measurements of height and weight of Goat Rearing and Non Goat Rearing family members were recorded in the morning before breakfast and Body Mass Index (B.M.I.) was computed. The height and weight of the subjects were measured by the method of Jeliffe (1966) and BMI was calculated as per Garrow (1986).

Collection and Analysis of Blood

Blood samples were collected from the Respondents under Goat Milk and Non-Goat Milk consuming categories randomly. Five ml blood was collected from each subject by radial venipuncture in to sterilized Test tubes containing an anti-coagulant (sodium citrate). Plasma was separated by centrifugation at 5000 rpm for 10 min in a Bench Top Centrifuge and decanted in numbered clean, dried plastic vials and stored in a deep freeze until further analysis for hemoglobin, cholesterol, triglycerides, high density lipoproteins and low density lipoproteins concentrations. Blood samples were collected in winter (November to February), rainy (July to October) and summer (April to July) seasons using the same procedure and used for analysis. (Ochei et al. 2000).

Dietary Survey

Information regarding the food intake of the Respondents was recorded by 24 hour recall method for three consecutive days for all the selected subjects/ individuals. The total numbers of 123 individuals (46 males, 33 females, 24 sons, 20 daughters) in Goat Rearing families were selected randomly. The respective values in Non-Goat Rearing families were 113 (40, 32, 21, and 20). The total number of females in different physiological conditions in GR families were 30 (10 pregnant, 10 lactating, 10 old age) and in NGR families were also 30 (10, 10, 10). The quantities of food consumed were converted into their raw equivalents. Standardized utensils were used for conversion. The

average nutrient intake per day per subject was calculated. The intake was compared with the recommended dietary allowances (RDA) worked out by Indian Council of Medical Research values (Gopalan et al. 1990). Nutritional status of the Goat Rearing and Non Goat Rearing families was worked out on the basis of their diet schedule and accordingly intake of total energy, carbohydrates, protein and fat was calculated in different seasons i.e. Winter, Rainy and Summer.

Health Status and Hygiene of GR and NGR Families

The data pertaining to health status of the Respondents viz. frequency of illness, seeking treatment of various illnesses, frequency of cleaning clothes, nails and bathing etc during different seasons were collected with the help of a developed questionnaire.

Statistical Analysis

Various statistical designs were used to analyze the data collected on socio-economic parameters to fulfill the specific objectives. These were frequency, per cent, means, and standard deviations for analysis of the variables. Milk and nutritional data were analyzed by one-way ANOVA (Analysis of Variance) in accordance with Snedecor and Cochran (1989) using Randomized Block Design (F test).

Result and Dissusion

In general, GR families expressed that frequency of illness was low but other social factors contributed. They got treated from nearby primary health centre and mostly prefer home remedies like kaada etc. Normally, they suffer from fever, cold, nausea, pneumonia, malaria, diarrhea and Anemia. 12 subjects suffered twice in a year rest once in a year. Out of 40, GR families in villages surveyed we found, on an average they took bath daily in summer and once or twice in a week in winter while women washed their hair on alternate day or twice a week in summer but once in a week in winter. However, they cleaned their face and hand daily. They brushed their teeth daily using Neem or Babool twig, or some tooth powder besides rinsing their teeth with water after each meal. They normally wash their clothes once in a week in summer and at monthly intervals during winter. Among the respondents, nail cutting practice was not regular. It was found that nails of women get trimmed during cleaning and washing of utensils or other household activities. Among men, nails used to be cut occasionally with the help of blade of safety razor. During winter, women and children usually suffered from lice and dandruff due to unhygienic conditions and irregular bathing practices. Women used Multani Mitti for washing their head and face and oiled their hairs using mainly the mustard oil. Twenty subjects of NGR families suffered four times in a year, 10 suffered thrice in a year and rest suffered frequently. Respondents availed health services both from private clinics and government hospitals/ dispensaries of non-goat farmers. Normally, respondents suffered from pneumonia, malaria, diarrhea, fever and tuberculosis but no tuberculosis was reported among goat rearing families. As far as modern consumer products are concerned, 15 families pertaining to NGR families used shampoo and good quality soaps, which was the reason for better hygienic conditions among them in comparison to the GR families.

Feeding Practices

On an average an adult goat was provided 1.0-1.5 concentrate, 2-3 kg greens, and 5 kg dry fodder besides providing mineral mixture (15g) and common salt (15g) twice in a week. While each cow was provided 1-2 kg concentrate, 10-13 kg green fodder, and 7 kg dry fodder daily and mineral mixture (100g) and common salt (20g) were provided twice a week. On an average each buffalo was provided 15-17 kg green f6dder, 5-6 kg concentrates including broken wheat and Jaggery, and 9-10 kg dry fodder (wheat straw) while mineral mixture (120g) and common salt (25 g) were provided twice a week. Concentrate and dry fodders were available round the year, but the availability of green fodders was seasonal.

Production status of animals maintained by GR and NGR families

Table 1. Health and hygiene among GR and NGR families

Goat rearing families	**No. of respondents (n = 40)**					
	F (GR)M	**% out of 40**	**F (GR)F**	**%out of 56**	**F (GR)C**	**% out of 130**
Frequency of illness	20	50	25	44.6	60	46.15
Health Services	14	35	18	32.1	35	26.9
Frequency of cleaning cloth, nails and body etc						
Summer	35	87.5	56	100	130	100
Winter	15	37.5	40	71.4	52	40
Non goat rearing families	**No. of respondents (n = 40)**					
	F(NGR)M	**%out of 50**	**F(NGR)F**	**%out of 55**	**F(NGR)C**	**% out of 124**
Frequency of illness	34	68	33	60	75	60.5
Health Services	30	60	24	43.6	55	44.4
Frequency of cleaning cloths, nails and body						
Summer	50	100	55	100	124	100
Winter	14	28	50	90.9	80	64.5

M- Male, F- Female, C- Children

Data pertaining to production status of animals owned by GR and NGR families in the surveyed area have been presented in Table 2. Milk production starts early and litter size was greater in goats than in cows/ buffaloes as kidding in goats yielded single, twins, triplets and sometimes quadruplets. The average milk yield in a lactation reported by the respondents was 56 kg in goats, 1080 kg in cows and 1920 kg in buffaloes.

Finance for maintenance and purchase of animals

In case of need, GR families got finance from private moneylenders while few got finance from other sources like neighbor, friends and relatives. Contrarily, NGR families arranged finance mainly from banks and money lenders. Few such families (10%) took loan from nationalized banks and 12.5% families took loan from private moneylenders for the purchase of cows and tractors, respectively.

Sale and purchase of milch animals during last 5 years

The GR families purchased 5-7 goats @ Rs. 500 on an average and sold 60 goats on an average rate of Rs. 800 per goat during last 5 years. However, among no NGR families, 6 families purchased cows and buffaloes @ Rs. 40000-50000 per animal and none sold their animals during last 5 years.

Value of manure

In case of GR families, the goat manure used to be sold @ Rs. 700/ 50 kg bag as these families did not have any mean to utilize it, however, NGR families used to sold the manure as well as utilized it at their after its composting or as fuel for cooking the food.

Milk consumption pattern in GR and NGR families

Milk production and its consumption and/ or sale by GR and NGR families have been presented in Table 3.In the study area, number of goats owned by GR families (105) was more than the cows (37) and buffaloes (40) owned by NGR families, however, total milk production by GR families (0.75 kg/day) was far less than that by NGR families (4.5 kg/day in cow

Table 2. Production status of milch animals owned by goat and non goat rearing families

Parameter	GR families	NGR families	
	Goat	Cow	Buffalo
Age at puberty (year)	0.75-1.5	3 -4	3-4
Age at first kidding/ calving (year)	1-1.75	4-5	4-5
Lactation period (months)	3-4	6-7	6-8
Kidding/ calving interval (months)	8-9	15-18	14-17
No. of services per conception	1-2	1	1
Litter size	2-1	1	—
Average milk yield in lactation (kg)	56	1080	1920

Table 3. Mean chemical composition of milk of goats, cows and buffaloes

Constituent	Goat milk	Cow milk	Buffalo milk
Fat (%)	$2.81^{a} \pm 0.05$	$3.84^{b} \pm 0.06$	$7.67^{c} \pm 0.11$
SNF (%)	$8.68^{a} \pm 0.06$	$9.42^{b} \pm 0.04$	$9.98^{b} \pm 0.08$
Total solids (%)	$11.15^{a} \pm 0.10$	$13.26^{b} \pm 0.13$	$17.55^{c} \pm 0.11$
Protein (%)	$3.19^{a} \pm 0.04$	$3.52^{b} \pm 0.03$	$3.89^{c} \pm 0.05$
Lactose (%)	$3.98^{a} \pm 0.04$	$3.61^{b} \pm 0.06$	$4.37^{c} \pm 0.05$
Total Ash (%)	$0.62^{a} \pm 0.02$	$0.66^{a} \pm 0.03$	$0.91^{b} \pm 0.04$
Calcium (mg/100ml)	$129.38^{a} \pm 2.49$	$108.31^{b} \pm 2.13$	$181.47^{c} \pm 2.17$
Phosphorus (mg/100ml)	$98.60^{a} \pm 1.59$	$95.45^{a} \pm 0.92$	$123.41^{b} \pm 1.48$

and 6.1 kg/day in buffalo). It was also evident that GR families consumed all the milk, which they produced; however, NGR families sold their produce either as raw milk or as milk product (curd). Among NGR families conversion rate of milk into milk products such as curd, paneer was high. Only 4-5 families used to process milk into paneer while almost 62 per cent of the NGR families used to convert milk into curd. The income was apparently highest among those maintaining buffaloes followed by those maintaining cows and lowest in GR families.

Milk composition

Composition of milk samples, collected from goats, cows and buffaloes, owned by the respondents during winter, summer and rainy seasons has been presented in Table. Average fat content in goat milk during winter, summer and rainy season was 3.07 ± 0.06, 2.98 ± 0.03 and 2.40 ± 0.09 %, respectively and the value for cow and buffalo milk was 3.73 ± 0.1, 4.25 ± 0.06 and 3.53 ± 0.07 % and 7.50 ± 0.17, 8.16 ± 0.11 and 7.35 ± 0.23%, respectively. Average total solids content in milk of goat, cow and buffalo was 11.72 ± 0.13, 12.78 ± 0.12 and 17.34 ± 0.18 % in winter, 11.68 ± 0.18, 14.03 ± 0.14 and 17.87 ± 0.14 % in summer and 11.10 ± 0.17, 12.96 ± 0.17 and 17.46 ± 0.25 % in rainy season. Statistical analysis of data revealed that milk fat and total solids contents varied significantly ($P<0.05$) among seasons. Mean milk protein content in goat milk during winter, summer and rainy seasons was 3.42 ± 0.06, 3.03 ± 0.08 and 3.13 ± 0.06%, respectively. Corresponding value for cow milk was 3.4 ± 0.04, 3.62 ± 0.05 and 3.51 ± 0.05%, while value for buffalo milk was 3.69 ± 0.07, 4.14 ± 0.06 and 3.86 ± 0.08 %. Variations among seasons for protein content was also significant ($P<0.05$). Sharma (2006) investigated the influence of winter and summer

Table 4. Physical health and physiological attributes of families rearing goats, cows or buffaloes in targeted area of western U.P. in different seasons (Pooled Means)

Parameters	Winter season			Summer Season			Rainy season		
	Goat milk	Cow milk	Buffalo milk	Goatmilk	Cowmilk	Buffalomilk	Goatmilk	Cowmilk	Buffalomilk
Body Weight (kg)	57.90^{a}± 1.65	60.95^{ab}± 2.90	66.85^{b}± 2.64	57.65^{a}± 1.61	60.75^{a}± 2.90	69.70^{b}± 2.05	56.95± 1.68	59.50^{a} ± 2.78	70.20^{b}± 1.88
Body Height (cm)	164.10± 1.53	163.00± 2.63	163.20± 1.83	164.43± 1.52	163.00± 2.63	162.60± 1.80	164.00± 1.53	162.15± 2.58	163.50± 1.75
Body Mass Index (kg/m^2)	21.30^{a}± 0.31	22.65^{a}± 0.63	25.11^{b}± 0.97	21.13^{a}± 0.30	22.57^{b}± 0.62	26.36^{c}± 0.69	20.97^{a} ± 0.32	22.37^{b} ± 0.60	26.31^{c}± 0.71
Systolic Blood Pressure (mm/Hg)	118.50± 1.45	122.00± 2.13	125.00± 2.64	118.78^{a} ± 1.48	122.00^{ab}± 2.13	127.90^{b} ± 2.97	120.00± 2.13	122.00± 2.13	128.30± 2.69
Diastolic Blood Pressure (mm/Hg)	80.93^{a}± 1.19	83.30^{ab}± 1.72	85.90^{b}± 1.27	80.63^{a}± 1.25	83.55$^{a\,b}$± 1.99	86.90^{b}± 1.65	81.40± 1.08	83.30± 1.45	87.05± 1.61

Table 5. Blood components in goat, cows or buffalo milk-drinking persons in different seasons (Mean ± S.E.)

Parameters	Winter season			Summer Season			Rainy season		
	Goat milk	Cow milk	Buffalo milk	Goatmilk	Cowmilk	Buffalomilk	Goatmilk	Cowmilk	Buffalomilk
Hemo globin (g/dl)	11.49± 0.35	11.50± 0.45	12.61± 0.46	11.29± 0.36	11.50± 0.45	12.59± 0.49	11.16± 0.35	11.46± 0.45	11.57± 0.47
Chole sterol (mg/dl)	143.24^{a}± 2.18	146.60^{a}± 4.07	157.32^{b}± 6.03	144.52^{a}± 3.45	148.50^{a}± 5.96	185.51^{b}± 6.91	138.06^{a}± 3.06	141.60^{a}± 3.00	180.50^{b} ±6.33
Trigly cerides (mg/dl)	110.48^{a}± 2.45	119.17^{a}± 5.08	129.97^{b}± 5.14	113.01± 2.88	123.94± 6.35	128.48± 7.23	112.22^{a}± 2.86	119.51^{ab}± 4.29	130.74^{b}± 6.84
HDL (mg/dl)	41.29 ^{a}± 0.84	40.32^{a}± 1.21	36.66^{b}± 1.15	41.45^{a}± 0.86	40.23^{a}± 1.18	35.86^{b}± 1.29	41.48^{a}± 0.85	40.61^{a}± 1.16	36.43^{b} ± 1.30
LDL (mg/dl)	109.33± 2.49	113.64± 4.22	119.40± 3.60	109.06^{a}± 2.44	114.01^{a}± 4.23	127.02^{b}± 2.42	111.11^{a}± 2.50	112.41^{a}± 4.39	125.42^{b} ± 3.04
VLDL (mg/dl)	14.84^{a} ± 0.67	17.94^{b}± 0.88	20.07 ^{b}± 1.21	14.52^{a}± 0.57	16.87^{b}± 0.83	23.43^{c}± 1.20	16.50^{a}± 0.60	15.79^{a}± 0.76	22.80^{b} ± 1.27

season on chemical composition of goat indicated that specific gravity, SNF and TS contents in Jamunapari milk were found significantly higher (1.030 ± 0.00, 8.76 ± 0.05 and 12.60 ± 0.12%) during winter season as compared to summer (1.026 ± 0.00, 7.76 ± 0.15 and 11.28 ± 0.16 %). However, fat content did not show any significant difference during both the seasons. Dutta and Tripathi (2009) reported slightly higher values for the average total milk solids, fat, SNF, protein, lactose and total ash in the goat milk in semi- arid region as 14.38, 5.73, 8.65, 3.91, 3.93, and 0.82%, respectively. District-wise variation in milk composition was attributed to the stage of lactation, parity of goats and season of sampling. Prasad et al. (2005) reported daily milk yield and composition in goats. The breed, stage of lactation, season of kidding and parity significantly affected both the milk yield and composition. Fat and total solids increased with advancing stage of lactation; however lactose had a reverse trend. The protein content of milk remained unchanged. There was no significant effect of season on milk yield, FCM (4%) and major milk constituents except fat content was significantly higher in the winter season.

Average lactose content of goat milk during winter, summer and rainy season was 4.13 ± 0.08 , 3.69 ± 0.06 and 4.11 ± 0.07% while value for cow milk in these seasons was 3.65 ± 0.14, 3.66 ± 0.08 and 3.51 ± 0.05% and in buffalo milk the value in respective season was 4.18 ± 0.07, 4.41 ± 0.09 and 4.53 ± 0.07%. Milk lactose content varied significantly ($P<0.05$) among seasons as recorded for other milk constituents.Average calcium content in goat milk during winter, summer and rainy seasons was 145.35 ± 0.07, 140.14 ± 2.51 and 108.62 ± 1.62mg/100 ml, respectively and corresponding value for cow milk was 109.27 ± 2.483, 109.92 ± 2.31and 109.27 ± 2.48 mg/ 100 ml and in buffalo milk the value in respective season was 187.02 ± 3.52, 168.09 ± 2.18 and 189.32 ± 3.55mg/ 100 ml. Seasons influenced the calcium content of goat and buffalo milk significantly ($P<0.05$), however, seasons did not have significant influence on calcium content of cow milk.Milk phosphorus content (mg/100 ml) in goat milk during winter, summer and rainy season was 102.45 ± 2.08, 103.63 ± 1.87 and 93.95 ± 1.63, respectively and the variation among seasons was significant. Similarly, cow's milk phosphorus content in respective season was 94.82 ± 1.5, 99.29 ± 1.29 and 92.24 ± 1.62 mg/ 100 ml and variation among seasons was significant ($P<0.05$). Phosphorus content in buffalo milk was higher than in goat and cow milk and the mean value during winter, summer and rainy seasons was 124.17 ± 2.8, 125.19 ± 2.47 and 120.86 ± 2.45 mg/ 100 ml and the variation among season was not significant. This value was slightly higher than the values obtained in the present study. The average Ca concentration in goat milk was reported 0.086 % by Dutta and Tripathi (2009). This value is lower than the values obtained in the present study which might be due to the variation in the methodology.

Park and Chukwu (1988) studied mineral contents of goat milk are much higher than those of human milk. Goat milk contains about 134 mg Ca and 121 mg P/100 mg while human milk has only one fourth to one sixth of these two major minerals. The Ca and P values were almost similar to that of present study. Agnihotri et al. (2002) also analyzed milk samples for major milk constituents, pH and titratable acidity (TA) during the month of February-April. The milk samples from villages revealed significant ($P<0.05$) difference in fat, TS, SNF, Casein, pH and TA with those of institute. Milk from Barbari and Jamunapari type animals had higher fat (3.86-3.93 %) and TS (12.15-12.25%) than nondescript and Sirohi goats. These values are commensurate with the present findings. The parity and stage of lactation did not affect the milk composition. The ash contents in milk from dams having single kid were higher (0.85%) than twins (0.80%). Compared to farm, milk samples from villages had lower TS (11.66 %) and fat (3.45%) contents and higher pH (6.59). Average milk composition of milk samples of goats, cows and buffaloes, collected from the respondents during the course of present study, irrespective of seasons have been presented in Table. Average fat content in goat,

cows and buffaloes milk was 2.81 ± 0.05, 3.84 ± 0.06 and 7.67 ± 0.11%, respectively. Average milk fat content was highest (7.67%) in buffaloes, followed by cows (3.84%) and lowest in goats (2.81%) and variation among species was significant (P < 0.05). Anjeneyulu et al. (1985) reported slightly higher values for milk of goat, cow and buffalo. This variation might be due to the method of analysis of milk by the author. Average total solids content in buffalo milk was highest (9.98 ± 0.08%) followed by cow milk (9.42%) and lowest in goat milk (8.68 ± 0.06%) and the variation among species was significant (P<0.05). Milk protein content in goat, cow and buffalo milk was 3.19 ± 0.04, 3.52 ± 0.03 and 3.89 ± 0.05%, respectively and variation among species was significant (P<0.05). Milk lactose content was highest in buffalo milk (4.37 ± 0.05) followed by goat milk (3.98 ± 0.04%) and lowest in cow milk (3.61 ± 0.04%). The milk protein content of goat, cow and buffalo was on lower side as compared to the present study as shown by Anjeneyulu et al. (1985).

This might be attributed to breed of animals as well as stage of parity. There was significant variation among species for milk lactose content. Similarly, total ash content of buffalo milk was significantly (P<0.05) higher (0.92 ± 0.04%) than cow milk (0.66 ± 0.06%) as well as goat milk (0.62 ± 0.02%).Average calcium content in goat, cows and buffalo milk was 129.38 ± 2.49, 108.31 ± 2.13 and 181.47 ± 2.17 mg/ 100 ml, respectively and variation among species was significant (P<0.05). Calcium content was significantly higher (P<0.05) in buffalo milk than in goat milk and cow milk. Average phosphorus content in goat, cow and buffalo milk was 98.60 ± 1.59, 95.45 ± 0.92 and 123.41 ± 1.48 mg/ 100 ml, respectively and the variation among species was significant (P<0.05). Phosphorus content was highest in buffalo milk followed by goat milk and lowest in cow milk. Milk sugar lactose is the major carbohydrate in goat milk lactose content of goat milk is about 0.2 – 0.5% less than that of cow milk (Posati and Orr, 1976; Haenlein and Caccese, 1984; Chandan et al. 1992). Sharma and Das (2010) reported that the total fat (%), SNF (%), T.S. (%), Protein (%), Lactose (%) and Ash (%) were 3.84 ± 0.03, 7.10 ± 0.06, 10.87 ± 0.09, 2.53 ± 0.02, 3.78 ± 0.03 and 0.61 ± 0.03 respectively. There was no significant breed difference in ash content of goat milk. Pooled goat milk samples were collected during different months to study the milk composition. A wide variation was observed in fat, S.N.F., T.S., protein and lactose content of goat milk. Fat (4.38 ± 0.08), S.N.F. (7.85 ± 0.10), T.S. (12.23 ± 0.16), Protein (2.95 ± 0.11) content was during the month of April. Lowest values were found for S.N.F. during May, June and July. Protein content was lower in goat milk during July month. However, lactose content was observed higher in February and lower in June and July. Goat milk produced during January month showed higher values for ash content and lower values were obtained during June and July month. In Summer, goat milk has the total fat(%), SNF(%), T.S.(%), Protein(%), Lactose(%) and Ash(%) were 4.04 ± 0.02, 7.56 ± 0.04, 11.61 ± 0.06, 2.73 ± 0.03, 4.10 ± 0.02, 0.61 ± 0.00 while in rainy and winter season, 4.18 ± 0.03, 7.57 ± 0.03, 11.72 ± 0.03, 2.66 ± 0.01, 4.08 ± .02, 0.61 ± 0.00 and 4.16 ± 0.03, 7.70 ± 0.04, 11.69 ± 0.09, 2.79 ± 0.02, 4.20 ± 0.02, 0.65 ± 0.02, respectively. Average body weight in GR families during winter, summer and rainy seasons was 57.90 ± 1.65, 57.65 ± 1.61 and 56.95 ± 1.68 kg respectively and the weight for NGR families were 60.95 ± 2.90, 60.75 ± 2.90 and 59.50 ± 2.78 kg and 66.85 ± 2.64, 69.70 ± 2.05 kg and 70.20 ± 1.88 (Cow and Buffalo) respectively.

The physical health in terms of body weight of families rearing goat as well as cattle was similar however, the body weight of families consuming buffalo milk was significantly (p<0.05) higher than the families consuming goat milk in all three seasons under the study. It is evident from this study that the rearing of type of livestock indicated that the families of lower economic strata were keeping goats only, which is clearly reflected in their lower body weights and plane of nutrition as well. Average height in goat, cow and buffalo farmers was 164.10, 163.00 and 163.20 cm in winter, 164.43, 163.00 and 162.60 cm

in summer and 164.00, 162.15 and 163.50 cm in rainy season respectively. There was no significant difference in terms of height of GR and NGR families in all seasons during study. Average Body Mass Index (BMI) of GR families in winter, summer and rainy season was 21.30 ± 0.31, 21.13 ± 0.30 and 20.97 ± 0.32 kg/m^2. Corresponding BMI of NGR (cow and buffalo) families was 22.65 ± 0.63, 22.57 ± 0.62 and 22.37 ± 0.60 kg/m^2 and 25.11 ± 0.97, 26.36 ± 0.69 and 26.31 ± 0.71 kg/m^2 respectively. Statistically analysis of data revealed that the BMI of families consuming buffalo milk significantly higher ($p<0.05$) than the families consuming cow and goat milk in winter season. However, the body mass indices differed significantly among all three types of milk consuming families in summer and rainy season. The average systolic blood pressure in GR families during winter, summer and rainy season was 118.50 ± 1.45, 118.78 ± 1.48 and 120.00 ± 2.13 (mm/Hg) respectively and the for systolic blood pressure in NGR(Cow and buffalo)families was 122.00 ± 2.13 ,122.00 ± 2.13 and 120.00 ± 2.13 mm/Hg and 125.00 ± 2.64, 127.90 ± 2.97 and 128.30 ± 2.69 mm/Hg respectively. Health status in case of systolic blood pressure of goat, cow and buffalo rearing families differed non-significantly in winter and rainy season. Systolic blood pressure of GR families was similar to the families rearing cow in summer season also but the Systolic blood pressure of buffalo farmers significantly ($p<0.05$) higher than the families rearing cow and goat milk in summer seasons under study. However, there was no correlation of both the families with the values of NGR (cow) families.

The average diastolic blood pressure in GR and NGR (cow and buffalo) families was 80.93 ± 1.19, 83.30 ± 1.72 and 85.90 ± 1.27 mm/Hg in winter, 80.63 ± 1.25, 83.55 ± 1.99 and 86.9 ± 1.65 mm/Hg in summer and 81.40 ± 1.08, 83.30 ± 1.45 and 87.05 ± 1.61 mm/Hg in rainy season respectively. The Blood Pressure in terms of diastolic condition of GR families was almost similar to cow keepers however, the diastolic blood pressure of families consuming buffalo milk were significantly ($p<0.05$) higher than the families consuming cow and goat milk in winter and summer seasons during study. The above study indicated that BMI of GR families was quite normal as compared to NGR (cow and buffalo) families. The low fat diet significantly contributes to maintain normal blood pressure and avoid critical heart problems. The review on this aspect is scanty thus not discussed. The average Hemoglobin (g/dl) in GR families during winter, summer and rainy season was 11.49 ± 0.35, 11.29 ± 0.36 and 11.16 ± 0.35 and Hemoglobin in NGR (cow and buffalo) was 11.50 ± 1.45, 11.50 ± 1.45 and 11.46 ± 0.45 and 12.61 ± 0.46, 12.59 ± 0.49 and 11.57 ± 0.47 respectively. Statistical analysis data revealed that goat rearing families was non-significantly differed from NGR families in all three seasons in this study. Similar trend was observed by Park et al. (1986) and Barrionuevo et al. (2002).

The average Cholesterol (mg/dl) in GR and NGR (cow and buffalo) families was 143.24 ± 2.18, 146.60 ± 4.07 and 157.32 ± 6.03 in winter, 144.52 ± 3.45, 148.50 ± 5.96 and 185.51 ± 6.91 in summer and 138.06 ± 3.06, 141.60 ± 3.00 and 180.50 ± 6.33 in rainy season respectively. The Physical parameter Cholesterol of GR families and cow keeping families was similar with no influence of seasons. On the contrary, Cholesterol of buffalo milk drinking families was significantly ($p<0.05$) higher in comparison to goat and cow milk drinking families in all seasons of the study. Blood component triglycerides of buffalo keepers varied significantly ($p<0.05$) from goat and cow keepers .The values of triglycerides was same in summer season of goat, cow and buffalo rearing families. The data showed that HDL and LDL of goat and cow milk drinking families were not changed among all seasons. In contrast, HDL and LDL of buffalo milk drinking families was significantly ($p<0.05$) higher in comparison to goat and cow milk drinking families in all seasons of the study. Alferez et al. (2001) also reported that the utilization of fat and weight gain was improved with goat milk in the diet compared to cow milk, and levels of cholesterol were reduced, while triglyceride, HDL, GOT and GPT values remained normal. The average VLDL (mg/dl)

GR families during winter, summer and rainy season was14.84 ± 0.67, 14.52 ± 0.57 and 16.50 ± 0.60 respectively, while average VLDL in NGR (cow and buffalo) families during winter, summer and rainy season was 17.94 ± 0.88, 16.87 ± 0.83 and 15.79 ± 0.76 and 20.07 ± 1.21, 23.43 ± 1.20 and 22.80 ±1.27 respectively. Statistical analysis data revealed the values of VLDL of GR families varied significantly ($p<0.05$) from NGR families. VLDL values of GR and NGR influenced in all seasons. The blood picture from above results indicated that the GR families were maintaining normal health across the seasons.

Nutritional components in GR and NGR families in targeted area of western U.P during winter, summer and rainy seasons was determined and presented in Table 24 (a). The average Energy (Kcal/d) in GR families during winter, summer and rainy season was 1688.4 ± 20.01, 1666.9 ± 19.07 and 1673.3 ± 20.1 respectively and in NGR families was 1723.3 ± 23.6 ,1706.1 ± 26.43 and 1713.2 ± 27.1 and 1849.1 ± 33.75, 1847.1 ± 27.37 and 1890.3 ± 38.81 respectively. In winter and rainy seasons, difference in energy was found significantly higher in GR and NGR families. But in summer season the difference in energy of buffalo milk rearing families was significantly higher than goat and cow milk drinking families, but in cow and goat drinking families, value of energy was almost similar. It can be inferred that the availability of energy component in the villages mostly depends upon the traditional menu of food prevailing in this area. In winter and summer seasons, the value of carbohydrate in goat and cow milk drinking families was found significantly different ($P<0.05$). But the value of carbohydrate in buffalo milk families was almost similar to goat and cow milk drinking families. Contrary to these findings, in rainy season, the value of carbohydrate was found significantly ($P<0.05$) higher in buffalo milk than to cow and goat milk drinking families and there was also significantly higher value of carbohydrate in cow milk to goat milk drinking families. The value of protein in winter season was significantly higher in cow milk to goat milk. But this value is almost similar in goat and buffalo milk. In summer season, the value of protein was found significantly higher in cow milk than to goat milk. But there was no difference in cow and buffalo milk. In rainy season, protein was significantly higher in buffalo milk than to goat milk. In winter and summer seasons, fat content was significantly higher than cow and goat milk. In rainy season, fat percent was found to be significantly higher in buffalo milk than to goat and cow milk. But in goat milk and cow milk the fat content was almost similar. Nutritional components in goat, cows or buffalo milk-drinking persons in targeted area of western U.P in respective of season of particular respondents was determined and presented in Table. The analysis of the data revealed that the value of energy was significantly higher in male sex than to female sex in goat, cow and buffalo milk drinking families. There was no difference in value of energy in family members within the sex. As per the I.C.M.R recommendation (2009) the energy requirement for the groups (male/female) doing moderate level work in the field area need 1900-3020 Kcal/d which is higher in comparison to the present study. It clearly indicates that the nutritional level of GR and NGR families in the present case were under nourished and there is a fair scope for sensitizing/complaining the rural village farmers for taking up balanced diet with the help of their own resources.

There was no difference in value of carbohydrate and protein in family members within the sex. According to the I.C.M.R recommendation (2009) the protein requirement for children and adults (male/ female) ranged between 83-88 g/d. In the present study the protein intake per day in the GR and NGR families was moderate ranging between 47-55g/d. The study indicated that there is a need to increase protein intake in the farm families/villagers. This may corrected by promotion of value addition in milk like preparing goat milk paneer /cow/buffalo milk paneer for balancing the protein requirement under field conditions. There was no difference in value of fat (g/ d) in family members within the sex. As per the I.C.M.R recommendation (2009), the fat requirement

for the groups (male/female) doing moderate level work in the field area need 25-45g/d, which is quite near to the present study. The fat intake was higher in case of NGR in comparison to GR families. The analysis of nutritional data over the females revealed that the value of energy, carbohydrate, protein and fat content in pregnant, lactating and old women were observed to be significantly higher in buffalo rearing families than to cow and goat rearing families. There were also significantly higher values in all these four parameters in cow milk than to goat milk families. The study indicated that the buffalo rearing families were economically better than the goat rearing families. Due to higher fat and protein content in buffalo milk, the health status of the females taking buffalo milk was sound. However, the health status of the females taking goat and cow milk were at par with respect to nutrition components.

Conclusion

In general, GR families expressed that frequency of illness was low but other social factors contributed. They got treated from nearby primary health centre and mostly prefer home remedies like kaada etc. Normally, they suffer from fever, cold, nausea, pneumonia, malaria, diarrhea and anemia. Twenty subjects of NGR families suffered four times in a year, 10 suffered thrice in a year and rest suffered frequently. NGR respondents availed health services both from private clinics and government hospitals/ dispensaries.

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