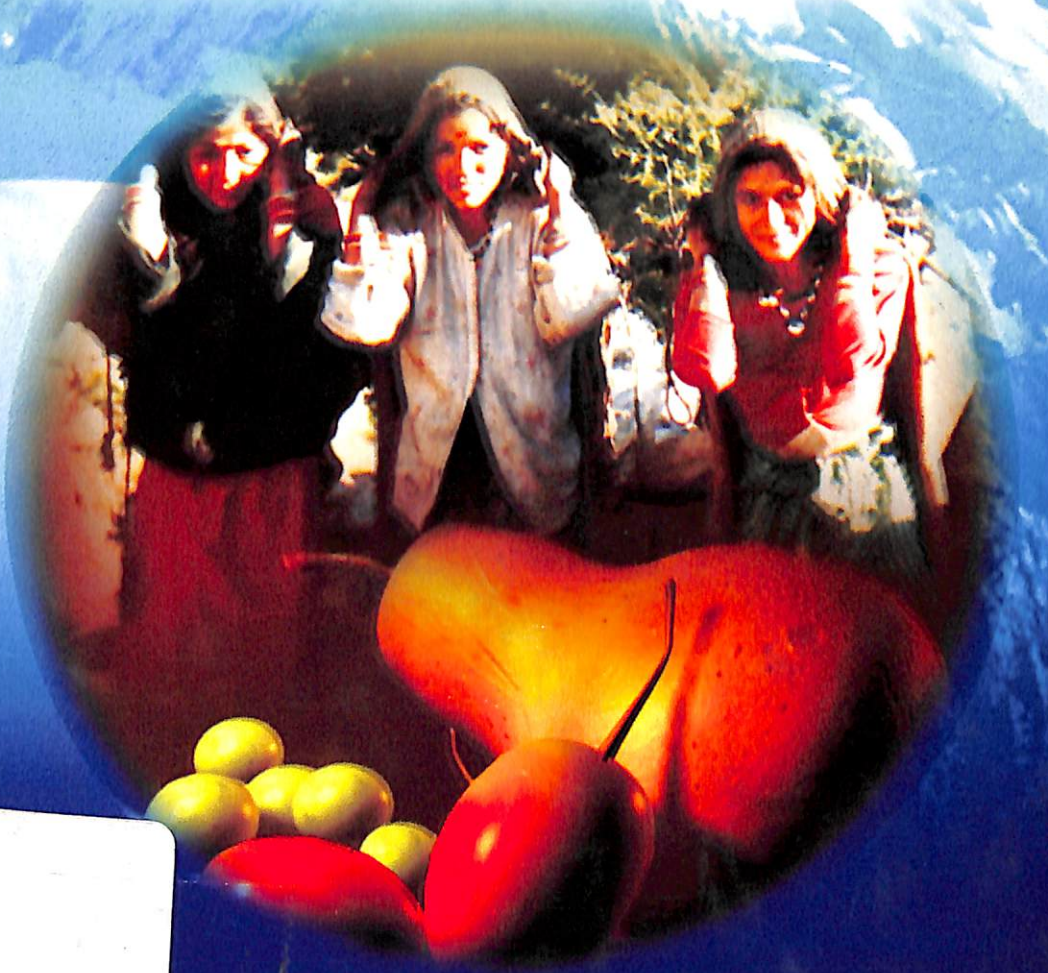
WOMEN AND NUTRITION IN HIMALAYA



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Women and Nutrition in Himalaya

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CONTENTS

PREFACE

More than two billion people of the world subsist on diets deficient in essential vitamins and minerals required for normal growth and development and for the prevention of premature death and disabilities such as blindness and mental retardation. Millions suffer from diseases caused by the consumption of inadequate nutritious food and unsafe water. About 40% of women in Sub-Saharan Africa suffer from iron deficiency anemia, as against approximately 60% of women in South Africa and in India. This rises to a staggering 83% during pregnancy. Therefore the poor care of girls and women by their husbands and elders leads to higher child malnutrition.

According to the World Health Organization, health is a state of complete physical, mental and social wellbeing and not merely an absence of disease or infirmity (Jhonstone, 1994). This has opened new vista of approach and has widened the scope and expectation involved in the promotion of health. Keeping this approach in mind the health of women need to be considered in broader perspective. So the evaluation of the health and nutrition status of the women require special attention.

Generally the nutrition status of a person is closely related to food adequacy and its distribution, per capita income, female literacy, family size, type of occupation, rate of population growth, hygiene sense, environmental sanitation and access to health, education, safe drinking water and other social services while the extent of nutrition awareness forms its basic ground in particular. Nutrition deficiency means lack of resistant power against communicable, non-communicable or deficiency diseases. In this part of Himalaya, excess workload coupled with inadequate intake of nutritious food

have led normal to severe mal/under-nutritional problem among the women. In fact cooking fewer meals, eating cold or leftover food or some times even skeepping meals have been reported in the several parts of the region as fuel saving strategies. This, over a period, can result a lower nutritional level. The main aim of this study is to calculate the nutrition status of most vulnerable section of the society—women as per their stage-general (non-pregnant-non-lactating), pregnant and lactating with the support of their socio-economic background. The present study will be helpful for the policy planning to overcome this severe problem of nutrition deficiency.

The present investigation is based on the first hand information. In all 136 sample women from 14 sample villages of Uttarakhand Himalaya have been surveyed comprehensively. The present book has been divided into five chapters. The first chapter consists of research problem, review of literature, objectives, research methodology and about the study area. The second chapter is devoted to environmental and demographic profile of Indian Himalaya which is based on secondary sources. The third chapter is given to the geophysical environment of the whole region (Uttarakhand)—physiography, geology, drainage, climate, natural vegetation and soils, which are based on secondary data and personal observations. The fourth chapter, which also devotes to the whole region of Uttarakhand, consists of eco-cultural environment in which demographic profile, fairs and festivals, landuse and allied sectors, food production and nutrition availability, infrastructural development and accessibility have been discussed. The fifth chapter is on women and nutrition–a case study which is based on first hand information of 136 sample women from fourteen sample villages. This chapter includes the category-wise socio-economic structure, housing and environmental sanitation, hygiene pattern, food habits, study of Body Mass Index, food consumption, nutrients intake pattern, etc. The last chapter provides the summary and conclusions.

This work could not have seen the light of the day without the valuable help of eminent scientists. The list of the experts who assisted in this endeavour is long and dreary I wish to thank all of them.

Grateful acknowledgement is conveyed to the University Grants Commission, 35, Feroz Shah Road, New Delhi for financial assistance during the Minor Research Project (1999-2002).

I express my deep sense of gratitude to Padamsree Prof. Mohammed Shafi, Department of Geography, A.M.U., Aligarh, Mr. V. Paul I.A.S Secretary Uttaranchal Government, Prof. P. C. Barakoti, Director Higher Education Uttaranchal and Prof. C. Gopalan, Nutrition Foundation of India, New Delhi, for their inspiration and guidance. I also express my gratitude respectively to Prof. J.C. Tiwary and Prof. M. Sayal, Principals, Govt. P.G. College, Bageshwar and Rudrapur for their kind help in various ways. I must put to record to my gratefulness to my then students Mr. G.S. Rawat, Mr. Narendra Singh Rautela, Mr. Gokul Chandra Pande, Mr. Bhaskar Pant and Mr. Bhariab Giri, Govt. P.G. College Bageshwar for their kind support during field work.

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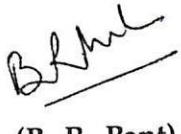

Rudrapur

(B. R. Pant)

1

INTRODUCTION

1.1 The Problem

The nutrition status of the people is an important indicator of the development of a country. Despite spectacular increase in foodgrains in recent decades the problem of chronic malnutrition continues to exist extensively, especially among children and women, because they are caught in the relentless sequence of ignorance, poverty, inadequate nutritious food intake and disease. Generally the nutrition status of a person, village, region or country is closely related to food adequacy and its distribution, per capita income, female literacy, family size, type of occupation, rate of population growth, hygienic sense, environmental sanitation and access to health, education, safe drinking water, and other social services, while the extent of nutrition awareness forms its basic grounds in particular. Thus the nutrition status is a result of complex and interrelated set of determining factors.

In the beginning of the 21st century, over 840 million people of the world, mostly from Africa, South Asia, and Latin America still do not get sufficient nutritious food to meet the

basic requirements for energy and protein. More than two billion people subsists on diets that lack of essential vitamins and minerals required for normal growth and development and for the prevention of premature death and disabilities such as blindness and mental retardation. Millions suffer from disease caused by the consumption of inadequate nutritious food and unsafe water. About 40% of women in Sub-Saharan Africa suffer from iron deficiency anaemia, as against to approximately 60% of women on South Africa and in India. This rises to a staggering 83% during pregnancy. Therefore, the poor care of girls and women by respectively their parents, husbands and elders leads to higher child malnutrition.

According to the World Health Organization (1948) "health is a stage of complete physical, mental and social well being and not merely an absence of disease of infirmity (Johnstone, 1994)". This has opened new vista of approach and has widened the scope and expectation involved in the promotion of health. Keeping of this approach in mind the health of women need to be considered in a broader perspective. So the evaluation of the health and nutrition status of the women require special attention.

According the 10th annual report of the Bread for the World Institute, during last fifty years, almost 400 million people died due to hunger and poor sanitation the world over. Further report says that the largest number of people who suffer nutritional deficiencies in South Asia, where poverty, discrimination against women, unsafe water and poor sanitation contribute to poor health. More than 50% of children under the age of five are stunted due to insufficient food consumption and poor health condition (Menon, N.C., *Hindustan Times*, 10-02-2000).

According to the Untied Nations Population Fund, the proportion of malnourished people has declined, but there has been an increase in the absolute number of people affected. The most affected are the women (Anon, 1998). The incidence of low birth weight babies – a sensitive indicator of well being of women has increased in nearly 50% of the countries (Hazra, 1998).

India has the highest number of female mortality during pregnancy and childbirth. According to the states of the World's Children Report, 410 out of every 1 Lakh new born babies in the country loss their mother during the delivery itself. More than 75% of the total population reside in the rural areas and slums in India. The economy of the rural people depend on agricultural practices which are mostly performed by the neglected and ignored section of the society – women; who constitute nearly 50% of the total population. Likewise India, women of Uttarakhand Himalaya also performs agricultural practices (primary activities) and contribute a major share of family economy in terms of kinds such as foodgrains, oil seeds, vegetables, fruits, milk, wool, etc.

In this part of Himalaya, excess workload coupled with inadequate intake of nutritious food have led normal to server mal/under nutritional problem among the women. Infact cooking less than required meals, eating cold or leftover food or sometimes-even skeeping meals have been reported not only in the region but also in several developing countries as fuel saving strategies. This practice over a longer period, can result lower nutritional levels.

Nutritional deficiency means lack of resistant power to protect from communicable, non-communicable or deficiency diseases. Despite overcoming the famines and eliminating classical nutritional deficiency syndromes like beri-beri, pellagra, scurvy, etc. However, the problem of protein – energy malnutrition, micro nutrients (minerals and vitamins) deficiency, deficiency of iron, vitamin A and iodine are especially important because of their serious health consequences and geographic distribution. These nutrition deficiency lead to the diseases like kwashiorkor, rickets, anaemia, blindness, goitre, etc. and even affects the learning ability. I.Q., productivity and physical and hormonal growth of human being.

The main objective of this study is to calculate the nutrition status of most vulnerable section among the people-women-as per their stage i.e. normal or general (non-lactating – non-

pregnant), pregnant and lactating with the support of their socio-economic backgrounds, awareness of environmental sanitation, hygiene pattern, etc. The present investigation will through the light on the complete scenario of women and nutrition in Uttarakhand Himalaya which will certainly provide valuable direction for the policy planning to overcome this severe problem of nutritional deficiency.

1.2 Review of Literature

Women not only in the Himalaya but also in the World as a whole have generally enjoyed a lower status than men in the society. Various cultural values and social institutions are responsible for lower status of women in comparison to men in our society. Due to various vigorous women's movements in recent past there has been a considerable increase of interest in the health and nutrition problem of women in the country.

Still undeveloped branch of Geography, the work in the field of Medical Geography was carried out in 1930s. In detail, Nutrition Geography is most important branch of Medical Geography. A number of macro and micro level studies have been made in the field of health and nutrition and its related fields in recent decades. Majority of these studies are concerned to food production and nutritional status of the people. The present investigation on women and nutrition has been particularly studied by the scientists of World Health Organisation, International Food Policy Research Institute, Washington D.C.; UNICEF; National Institute Nutrition, Hyderabad; Indian Council of Medical Research, New Delhi; International Institute of Population Sciences, Mumbai; Nutrition Foundation of India, New Delhi; National Nutrition Monitoring Bureau (NNMB), the National Family Health Survey (NFHS), Department of Women and Child Development Government of India, etc.

Other individual eminent workers who have carried out directly or indirectly on socio-economic and nutritional status surveys in different parts of the World include Kramer (1987),

Baird (1947), Barros *et al.* (1987), Simpson *et al.* (1975), Samuel and Rao (1992), Chatterjee and Lambert (1990), Kisanga (1990), Krasovec (1991), Tripathi *et al.* (1987), Karmarker *et al.* (1995), Geervani *et al.* (1983), Gopalan (1989a and 1989b), Gopalan and S. Kaur (1989), Gopalan and H. Kaur (1993), Ramotra (1989 and 1995), Sood and Nagla (1999), Wong (1995), Chaudhary and Trovoto (1994), Wong (1999), Salaff (1976), Baker (1996), Srinivasan and Kanitkar (1989), Rao (1989), Srikantia (1989), Ram Chandran (1989a , 1989b and 1996), Mathai (1989), Chatterjee (1989), Hazra (1998), Sachdeve (1997), Prentice (1998), Vir and Nigam (2001), etc. But these studies are primarily confined to other than Himalayan Region. The present attempt is basically non-clinical (geographical point of view). Therefore, the present exercise will not only fill up the academic gap but also provide the measures for nutritional security to women and children at large (Pant, 2001, 2002, 2003 and in press a, b, c).

1.3 Aims and Objectives

The issue of women and nutrition in the mountainous region like Uttarakhand Himalaya is not highly complex and intricate but also difficult. It is not possible to examine all individual women for nutritional study. Therefore, it is inevitably limited to some major aspects of limited individual women. The specific objectives of the present study are:-

1. To study the environmental degration and demographic profile of the Indian Himalaya.
2. To study the geo-physical and eco-cultural environment of the region as a whole (Uttarakhand).
3. To select the sample women – normal or general (non-lactating and non-pregnant), pregnant and lactating women from the sample villages located in different geo-physical divisions.
4. To study the socio-economic status of sample women.
5. To study the specific aspects such as fertility pattern, abortion tendency, intoxicants use and some silent

features of lactating women, pregnant women and their offsprings.

6. To study the infrastructural facilities available in the region and sample villages.
7. To study the housing and environmental sanitation condition.
8. To study the personal hygiene and dietary pattern of the sample.
9. To calculate the category-wise nutrition status of the total sample.
10. To study the awareness among the sample.
11. To suggest some feasible measures to overcome this serious burning problem.

1.4 Hypothesis

Women of this rural based country are busy since early morning to late night. Right from cleaning the agricultural fields, breaking of pods, removal of manure, fetching water from distant hilly terrain, collecting and carrying heavy loads of fuel wood, fodder, litter fall on head or back from remote places, cooking, nursing babies, washing and than feeding as well as milking animals etc. Besides these routine works women also look-after old ones and ailing family members. Presently majority of women spend more than 15 hours daily while few years back their mother spend half of this time for the same because water, fuel and fodder were easily available nearby the villages with the good cooperation from their male counterpart. Unfortunately in present time majority of the male population accomplish their ancestrally ordained work of ploughing and do nothing except this. It is also noticed that young male people were found in playing the cards or gamble.

Because of the continuous and strenuous working hours and repeated pregnancies women fall under the grip of moderate to severe mal and under nutrition and consequently

they suffer from various health problems. The hypothesis of the present study are:-

1. The environmental factors decide the crop and crop production of any area the consumption pattern is found in accordance with the cropping system.
2. Consumption pattern and dietary habits decide the nutrition status of the people (women).
3. The women nutritional requirements are depend on their age, occupation, stages – general (non-lactating and non-pregnant), pregnant and lactating etc.
4. The effect of nutrient intake deficiency directly comes on the deficiency diseases and mal nutrition.
5. The under-nourished women tend to deliver low birth weight babies and have pregnancy complications.
6. The housing condition, environmental sanitation and personal hygienic sense indicate the awareness and would decide the disease pattern among the people.
7. The mal nutrition among the women determines the morbidity and mortality.
8. Through awareness campaign about the importance of personal hygiene, housing condition, environmental sanitation, modification in food habits, nutritional level and finally health status of the women in the region can be improved to some extent.

1.5 Research Design and Methodology

The main aim of the statistical sampling is to obtain, representative sampling of the rural women population as possible from each stratum so that the data collection regarding the socio-economic conditions, demographic profile, housing condition, environmental sanitation, hygiene pattern, dietary intake, food habits and nutritional status may closely reflect the situation as it exists in overall women. Random sampling procedures have been adopted to collect the authentic and relevant information.

1.5.1 Regional Division

From the Gangetic Plain in the south to a comparatively less elevated rainshadow zone of Trans Himalaya in the north, Uttarakhand Himalaya possesses a great physical diversity. For the present study the region has been divided into six latitudinal divisions Tarai, Bhabar, the Siwalik and Dun, the Lesser Himalaya, the Great Himalaya and the Trans Himalaya. Among these divisions there are number of differences concerning soil type, cropping pattern, density of population, infrastructural development, relief, climate etc. The study of 136 sample women from fourteen villages – three villages selected from Tarai, three from Bhabar, two from Dun, five from the Lesser Himalaya and last one village represents the Great Himalaya – lies close to the Great Himalaya has been completed during the specified period of Marh 1999 – February 2001. It is worth to mention that no sample village has been studied from the Trans Himalaya.

1.5.2 Selection of the Sample Women

Among the married women between the age of 15 to 59 years, ten sample except six sample women from village Bharatpur No. 1 of three categories – general, pregnant and lactating from all segments of the society have been randomly selected from the sample villages. A total 136 sample women – 39 general category, 44 pregnant and 53 lactating category women from the fourteen sample villages have been selected for the detailed study.

1.5.3 Method of Data Collection and Analysis

Data pertaining to socio-economic base, housing condition, environmental sanitation pattern, hygiene pattern, food intake etc. of the sample has been collected with the help of well structured questionnaires during door to door survey in 1999-2000. Overall information of the region has been gathered from secondary sources – statistical diaries, censuses, Survey of India Topographical Sheets, geological literature etc. Each food items taken by the women has been collected in local

units and then converted into standard units in gram and milligram and finally converted into various nutrients-energy, protein, fat, carbohydrates, mineral and vitamins with the help of food composition tables and then percentage departure has been compared with the standard requirement for each group (stages) separately (Gopalan *et al.* 1993). For the calculation of Body Mass Index (BMI), height and weight have been measured at the time of survey. Body Mass Index has been calculated using the formula weight (kg)/height^2(m) and then classified into several degrees of Chronic Energy Deficiency (CED) as defined by James *et al.* (1988). The findings have been displayed in cartographic representation such as diagrams, maps etc.

1.5.4 Tools to be Used in the Collection of Data

Physical environmental study has been done with the help of Survey of India Topographical Sheets, Forest records, geological maps, literature and direct observations. Information of the overall pertaining to demography, landuse, agriculture, livestock, horticulture, amenities etc. has been gathered from the secondary sources such as statistical handbooks, census etc. Information of the sample women pertaining caste, age, literacy, occupation, workload, sanitation, hygiene, food intake habits, food consumption, behavioral tendency etc. has been collected and noted during the field work with help of questionnaires and observations. Height and weight of the sample women have been measured with the support of the measuring tape and potable weighing machine. Food items taken by the women have been measured into local units (*nali-ser, glass* etc.) and then converted into standard units of kg, grams, milligrams etc. with the help of conversion formula.

1.6 Relevance to the Present Day Problems and Needs of the Society and the Country

Despite the development in terms of infrastructural set-up and increases in food production in recent decades in

general, the health status of the people and women in particular has gone bad to worse. A human being needs a wide range of nutrients to keep her/him healthy and active, most of these nutrients derive from his/her daily intake. Due to inadequate of various nutrients such as energy, protein, fat, minerals and vitamins, majority of the people suffer from under nutrition and malnutrition. Women are most affected segment of this nutritional consequences. So far as the nutritional requirements are concerned women have the additional burden of the bearing and rearing children during their reproductive periods, menstrual cycles, pregnancy and lactation, the nutritional needs of women increase significantly to meet the extra demand of these additional physiological stresses. But these aspects have been ignored in present study region. As a result of this women suffered a lot of health problems. The present investigation would be helpful to understand the causes of these consequences and would propose applicable remedies to overcome these fatal problems. The present study would also be useful for planners and policy makers of the country and region at the time when the health and nutritional problems of women are concerned. Therefore an exercise of this nature is very necessary and relevant.

1.7 The Study Area

The Himalaya constitutes one of the greatest and youngest folded mountain systems in the world rising from 200 m to more than 8000 m above sea level. The Himalaya makes the northern boundary of India extending from eastern border of Pakistan to the western border of Myanmar and having length of 2500 km and width varying from 250 to 400 km. The Himalaya encompasses an area of about five lakh km^2. From east to west it has been divided into four sections 560 km long Punjab Himalaya extends from Indus to Sutlej, 320 km Kumaun Himalaya extends from the Sutlej to the Kali (Sharda), 800 km long Nepal Himalaya lies between the Kali and the Tista and 820 km long Assam Himalaya extend from the Tista to the Myanmar (Brahmputra) or eastern most border of Arunachal Pradesh (Burrared *et al.* 1933, Pant, 1995a and 1998).

Table 1.1. Uttarakhand Himalaya: At a Glance

Particulars	*Districts/Region*								
	Uttarkashi	*Chamoli*	*Tehri*	*Dehradun*	*Pauri*	*Pithoragarh*	*Almora*	*Nainital*	*Uttarakhand*
Total Area (Km^2)	8016	9125	4421	3088	5440	8856	5385	6794	51125
Inahbited village (No.)	669	1516	1953	743	3237	2174	3019	1806	15117
Development Block (No.)	06	11	10	06	15	12	14	15	89
Tehsil (No.)	04	07	05	04	06	06	05	08	45
Urban Unit* (No.)	03	08	04	16	08	05	05	25	74
Population (1991)	2,39,709	4,54,871	5,80,153	10,25,679	6,82,535	5,66,408	8,36,617	15,40,174	59,26,146
Rural (%)	92.80	91.90	94.33	49.74	88.11	92.56	93.60	67.34	78.30
Urban (%)	7.20	8.91	5.67	50.26	11.89	7.44	6.40	32.66	21.70
Density (P/km^2)	30	48	130	329	123	63	153	233	115
Total Literacy**(%)	47.23	61.08	48.38	69.50	65.35	59.01	58.66	56.62	59.58
Male Lietracy (%)	68.74	82.01	72.10	77.95	82.46	79.44	79.96	67.88	75.51
Female Literacy (%)	23.51	40.37	26.41	59.26	49.44	38.37	39.60	43.19	42.58
Scheduled Caste (%)	22.78	17.49	14.20	13.40	13.52	20.45	22.02	15.80	16.70
Scheduled Tribe (%)	0.96	2.26	0.11	8.20	0.22	3.23	0.33	5.84	3.54

Source: Anon, 1991a and 1991b.

Note: 1. New districts of Udham Singh Nagar, Champawat, Bageshwar, and Rudraprayag have not been considered separately. Related information of these districts are included in their parent districts.
* Census town ** excluding below 7 years population.

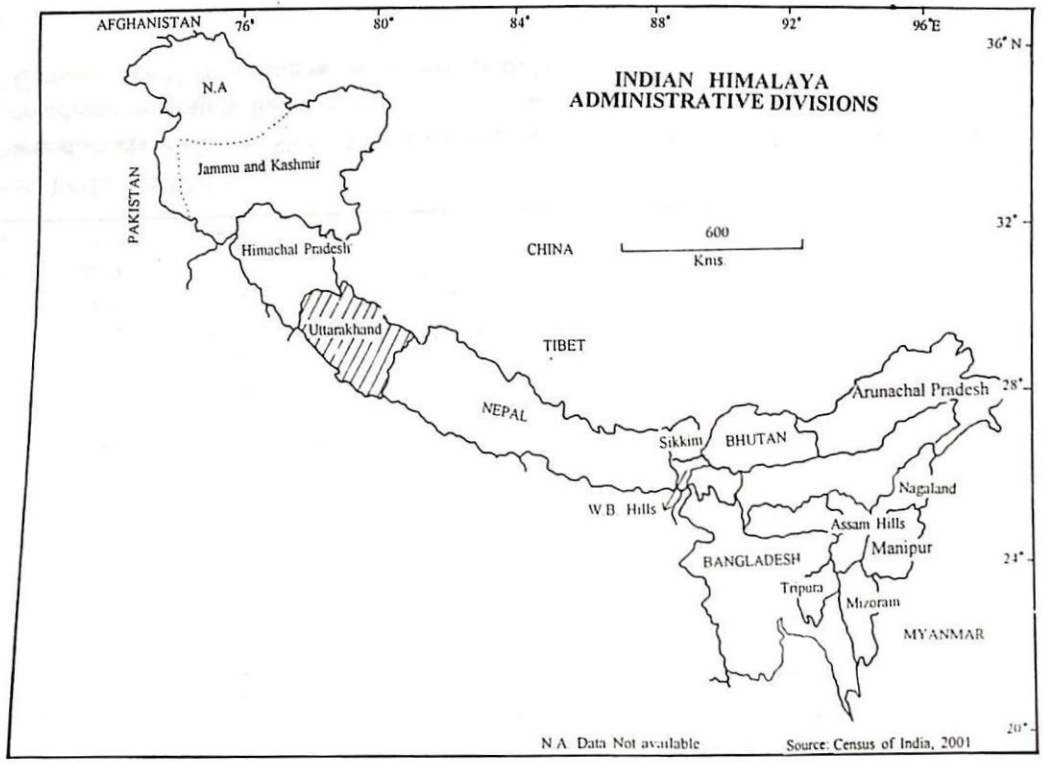

Fig. 1.1. Location of Uttarakhand in the Indian Himalaya.

Fig. 1.2. Administartive Units of Uttarakhand Himalaya.

The Planning Commission of India (1982) has also divided the Himalaya into three broad regions – the Western Himalaya consisting of the States of Jammu & Kashmir and Himachal Pradesh, the Central Himalaya consisting of Kumaun and Garhwal divisions (Uttarakhand), and North Eastern Himalaya comprising the states of Sikkim, Manipur, Tripura, Arunachal Pradesh, Nagaland, Mizoram, and hill districts of Assam and West Bengal. From northern boundary of Gangtic Plain to the extreme north upto the India boundary with Tibet (China), the Himalaya is divided into several geo-physical divisions – the Outer Himalaya consisting of the Tarai, Bhabar, Siwaliks and Duns, the densely populated Lesser Himalaya having a number of fertile river valleys, terraces, the Great Himalaya – a zone of high snow peaks, glaciers and a birth region of valleys, terraces, the Great Himalaya – a region across the Himalaya. These latitudinal divisions are separated from one another by thrusts/faults such as Himalayan Front Fault (HFF) exist between the Siwalik and Bhabar, Main Boundary Thrust (MBT) lies between the Lesser Himalaya and Siwaliks, Main Central Thrust (MCT) separated the Lesser and the Great Himalaya and Trans Himadri Thrust (THT) lies between the Great and the Trans Himalaya (Pant, 1995a and 1998) (Fig. 3.1). Total population of Indian Himalaya is about 3.5 crore persons in 2001 account 3.6% population of the country. Out of the total 48% population in female in the Himalaya. It records about 28% population growth during 1991 to 2001.

Being a distinct geographical entity Uttarakhand Himalaya is selected for present investigation. Since it possesses almost all the environmental condition of the Indian Himalaya, the study would analyse the problem of women and nutrition of the Himalaya except some high altitudinal tribal society. These are several social and ethnic groups such as Raj, Bhotia, Tharu, Buksha, Jaunsari, Punjabi, Gujjar, Bengali, Muslim, Scheduled Castes, Brahmin, Rajput, Nepali, Other Backward Classes etc.

The Uttarakhand Himalaya is considered to be densely forested area, place of God and Goddesses and the home of wild animals and also got recognition to be a confluence of various cultural groups come down from central Asia in the

north and the Gangetic Plain in the south. It extends from the Tons-feeder of Yamuna River in the west to the Kali or Sharda in the east. Its northern boundary is demarcated by Indo-Tibet water parting ridge and southern boundary corresponds almost with the southern limit of Tarai belt separating it from Saharanpur, Haridwar, Bijnor, Muradabad, Rampur, Bareilly, and Pilibhit districts (Fig. 1.2). Administratively, Uttarakhand Himalaya includes 12 districts of newly created Uttaranchal State. Historically, the region under the present study has been divided into two divisions – Kedarkhand and Manaskhand – presently Kedarkhand includes the districts of Dehradun, Uttarkashi, Tehri, Rudraprayag, Chamoli, and Pauri and Manaskhand spreads over the districts of Almora, Bageshwar, Pithoragarh, Champawat, Nainital and Udham Singh Nagar. Lying between 28°44′ and 31°25′ North latitudes and 77°45′ and 81°1′ East longitudes, it encompasses an area of 51125 Km^2 and a population of 70.35 lakh persons in 2001 (Fig. 1.2). Approximately 3074 km^2 of land form the Almora district, 2311 km^2 Bageshwar district, 3422 km^2 Nainital, 3372 km^2 Udham Singh Nagar district, 7212 km^2 Pithoragarh, 1642 km^2 Champawat, 7626 km^2 Chamoli, 3088 km^2 Dehradun, 5397 km^2 Pauri, 3796 km^2 Rudraprayag, 8016 km^2 Uttarkashi districts. Out of total population in 2001, there are 12,79,083 person in Dehradun, 12,34,548 in Udham Singh Nagar, 7,62,912 in Nainital, 6,96,851 in Pauri, 4,62,149 in Pithoragarh, 6,04,608 in Tehri, 3,69,198 in Chamoli, 2,94,179 in Uttarkashi, 2,49,453 in Bageshwar, 2,27,461 in Rudraprayag 6,30,446 in Almora and 2,24,461 person in Champawat district (Anon, 2001).

It is worth to mention that 136 sample women from 14 villages of Kumaun Himalaya (Manaskhand) were selected for detailed study. As already mention that new Uttaranchal state came in to existence on 9th November 2000 including a Hardwar additional district of Uttarakhand region. In the present study Hardwar district has not been included due to the paucity of relevant data while new districts – Udham Singh Nagar, Bageshwar, Champawat and Rudraprayag have not been considered separately. All these newly formed districts are included in their parent districts.

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