

## Haulage Methods in Different Areas of Nepal and the Health Condition of the Porters in Kathmandu

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**Abstract:** The complicated geographical features of Nepal make transport of goods difficult. People have to depend on human power even today, especially porters who use a number of different transport styles. The objectives of this study were to document (1) the characteristics of haulage methods in relation to the geographical conditions, and (2) the diurnal activities and health of porters in Kathmandu. The observed methods used by the porters in Nepal to carry loads were divided into four main classes: (1) on the top of the head, (2) by handcart, (3) in baskets on a yoke across the shoulders, and (4) on the back using a tumpline. The method of carrying a load on the back with a tumpline was most commonly observed, although this style might cause damage to the spinal vertebrae. The study of the diurnal activities and health condition of porters was limited to those in Kathmandu. For this purpose seven porters were interviewed orally. The results can be summarised as follows: (1) luggage of about 60kg to 110kg could be carried, (2) six of the seven porters habitually smoked tobacco and drank alcohol, (3) many porters wore cloth tightly twisted around their waist, and (4) complaints of severe neck pain were not made, but all porters complained of knee and/or back pains. The cervical and lumbar vertebrae of these porters were examined by roentgenological analysis, but no abnormal changes were observed.

*Key words:* Nepalese porter, haulage, health condition, cervical vertebrae, lumbar vertebrae.

### INTRODUCTION

When transporting some goods from place to place, people in Nepal still have to depend heavily on human power, because of geographical restrictions. This study concerns the methods for carrying loads, the resultant postures, related cultures and geographical conditions in different parts of Nepal.

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Research on the methods of carrying loads belongs to the study area of postures. For instance, Hewes (1955, 1957) reported about 480 postures determined by culture around the world, and posture has been related to work practice (Kawada, 1988; Maie, 1989). Kouhara (1986) showed 46 kinds of carrying technique and grouped them according to the body part used, namely the top of the head, back, shoulder, waist and hand. Subsequent studies have investigated the damage or pressure exerted on the cervical vertebrae when carrying loads using the top of the head (Levy, 1968; Yoganandan et al., 1996) and the change in ECG due to load carrying (Holewijn, 1990). However, there has been little discussion about carrying loads on the back using a tumpline as used in many parts of Nepal. In addition, there appear to be no studies debating this carrying technique in relation to the geographical conditions and culture where it is employed.

This study focuses on porters in Nepal, especially those in Kathmandu. Though most of the porters live in the Mountain zone, some live in other areas. There are two kinds of porters in Nepal, one for haulage associated with every day life and another for trekking. The porters involved with general everyday haulage carry various goods including rice, boxes and refrigerators. Porters, who work for trekking, carry the tents and foods necessary for trekking in the mountains. When mountaineering in winter, trekking porters are particularly in demand for their knowledge of the mountains and their marked physical strength. Therefore, when investigating the porters in Nepal, it is necessary to distinguish between the porters for every day life and those for trekking.

In Kathmandu, the porters have an insecure social position and their income is uncertain. They always carry luggage either on their back using a tumpline or by pushing a cart. Carrying loads on the back with a tumpline does not appear to be a good haulage technique, due to the possibility of intermittent high pressure being exerted on the cervical vertebrae, and consequent degenerative changes in the spinal column.

To sum up, the purpose of this paper is to take a general view of load carrying in Nepal with reference to the geographical conditions, and to examine the social standing and the health condition of porters in Kathmandu.

## METHODS

### *Haulage techniques*

Nepal is situated in the continent of Asia. The country has an east-west elongated shape with a length of approximately 800 km and a width ranging from 150 to 180 km. The country can be divided into three main geographical regions: a) the Terai zone, which is an area of low land about 26 to 32 km wide, with a maximum altitude in Nepal of 305 m and occupying about 17% of the total land area of Nepal, b) the Mountain zone in the north of the country with an altitude above 3,353 m, which accounts for about 64% of total land area of Nepal, and c) the Himalayan zone with altitudes between 4,877 m and 8,848 m and the snow line around 4,800 m.

According to the geographical features two places were selected for each of the three

different geographical areas in Nepal (Fig. 1). In the Terai zone, Nepalganj in the central west region and Bhairawa in the west region, inhabited by many tribes live, were selected. In the Mountain zone, Kathmandu in the central region, where many inhabitants were Newali, and Jumura in the central west region, where many people were of the Chetree or Tibetan tribe. For the Himalayan zone, Jomsone in the west region and Lukura in the east region were examined. Members of only the Takari tribe and Tibetans lived in Jomsone and the vicinity, whereas only Sherpa tribe and Tibetans lived in Lukura and its vicinity.

In each of these places, observations were made on the tribes of the porters and on the techniques employed for carrying their loads.

#### *Diurnal habits and the health condition of porters in Kathmandu*

In and around Kathmandu there existed two base areas for porters. One was Balaju about 5 km northwest of Kathmandu, the other was Mahaboudha in the centre of Kathmandu. The usual practice was to negotiate with the porters there to carry luggage. In this study, porters from the Tamang tribe, originating from the northwest region of Nepal, or the Magar tribe, from the northeast of the country, were chosen randomly from those who worked around Mahaboudha.

Height and weight were measured and the porters were interviewed individually concerning their: 1) family structure, 2) maximum weight of load carried, 3) length of career, 4) type of meal, 5) daily alcohol consumption, 6) cigarette smoking and 7) bodily injury.

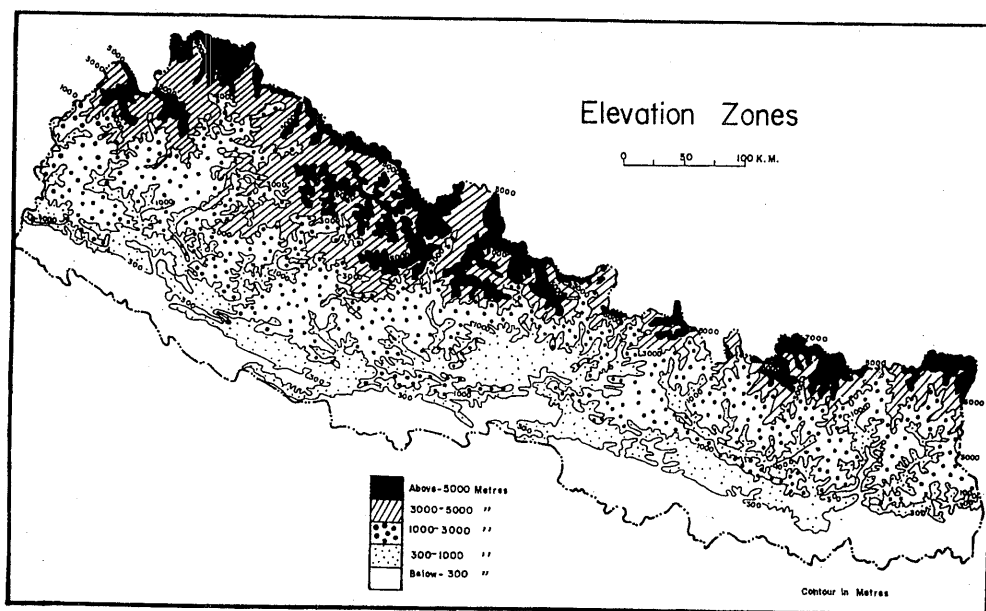


Fig. 1 Elevation zones in Nepal. The Tarai zone is the lowest in elevation. From this area towards the north, the elevation rises up to the Himalayan zone. (Source: Educational Enterprise Pvt. Ltd. (1988) Nepal in map, Kathmandu)

X-ray photographs of the cervical and lumbar spine regions of the seven porters were taken to investigate possible changes in the cervical and lumbar vertebrae. The ratio of the front length to the back length for each vertebral body was calculated and compared (Fig. 2).

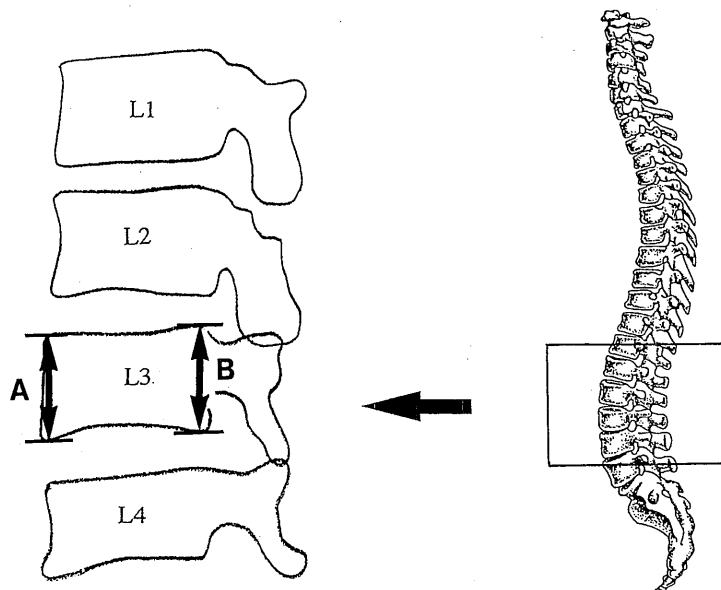


Fig. 2 Right: A lateral view of the vertebral column. (Source: Banister, E.W. et al. "Laboratory experiments in human structure & function" 1994.) Left: A traced lateral view of an original X-ray photograph of the lumbar vertebrae of a Nepalese porter in this study.  $A/B$ =ratio of anterior length of vertebral body/posterior length of vertebral body for each vertebrae.

## RESULTS

### *Haulage techniques*

Amongst porters carrying luggage and/or commodities in Nepal, there were four different load carrying styles: 1) on the top of the head, 2) by handcart, 3) in baskets on a yoke across the shoulders, and 4) on the back using a tumpline (Fig. 3).

#### 1) On the top of the head

When many small items of luggage or a water bottle were carried, a wide bottomed conical basket was used with a rung of bound cloth placed between the basket and the top of the head. The walking posture was rarely moved up or down, and the waist acted as a fulcrum to keep balance whilst maintaining a straight back. This technique was used by males and females regardless of age.

#### 2) By handcart

Luggage was put on a wheeled carrier and pushed from the back. This method was

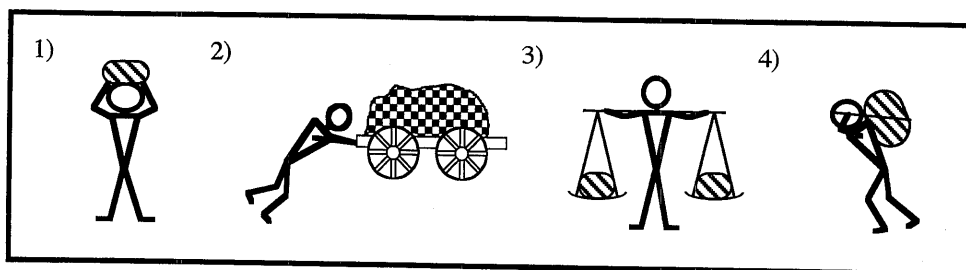


Fig. 3 The difference of haulage methods seen in Nepal: 1) on the top of the head, 2) by handcart, 3) in baskets on a yoke across the shoulders, and 4) on the back using a tumpline.

used when porters could not carry the load themselves, but this was not seen in use by women.

### 3) In baskets on a yoke across the shoulders

This haulage technique with loads placed in baskets suspended from a yoke across the shoulders was sometimes seen in use among merchants.

### 4) On the back using a tumpline

With this method, the load was carried on the back using a rope suspended from the front of head (Fig. 4). When several small pieces of luggage of unstable luggage were being carried a conical basket ('*ḍoko*') was usually employed. When carrying loads this way, the walking posture of the porter hardly moved up or down, and the knees acted as a fulcrum. This technique was also used by both men and women regardless of age.

### *Diurnal habits and the health condition of the porters in Nepal*

Data on age, family, height and weight for Kathmandu porters studied are shown in Table 1. There seems to be no particular relationship between age and the length of the declared work career of the porters interviewed, their family structure, height (148.4 cm to 168.5cm) or weight (42.2 kg to 56.0 kg).

The diurnal activities and eating habits of the porters are detailed in Table 2. According to oral interview, individuals usually carried loads of approximately 60 kg to 110 kg. When using a handcart they claimed to transport loads of approximately 200 kg to 400 kg individually, but 1,000 kg with three persons. The length of their careers as porters, up to the time of interview, ranged from 6 years to 25 years. Usually they had two meals each day, which was common to most other people in Nepal. The type of meal was called '*dāl-bhāt-tarkārī*' ('*dāl*' meaning boiled well soup made from bean, '*bhāt*' meaning rice, '*tarkārī*' meaning boiled or fried season vegetables). The meals sometimes included meat, either goat or chicken, but mostly the porters lived on rice. This diet is common in Nepal. All the porters interviewed drank alcohol; a few glasses every day to help refresh their body condition, they said. An average glass held approximately 150ml and the contents were more than 45% alcohol. Although the porters knew smoking tobacco was bad for their health, six out of the seven porters habitually smoked cigarettes. None complained of neck problems, but they

identified pain with different unexpected incidents. In contrast, all the porters interviewed complained of pains in their knees and/or backs. The porters did not have any special knowledge of preventive measures to avoid occupational problems. However, most wore cloth

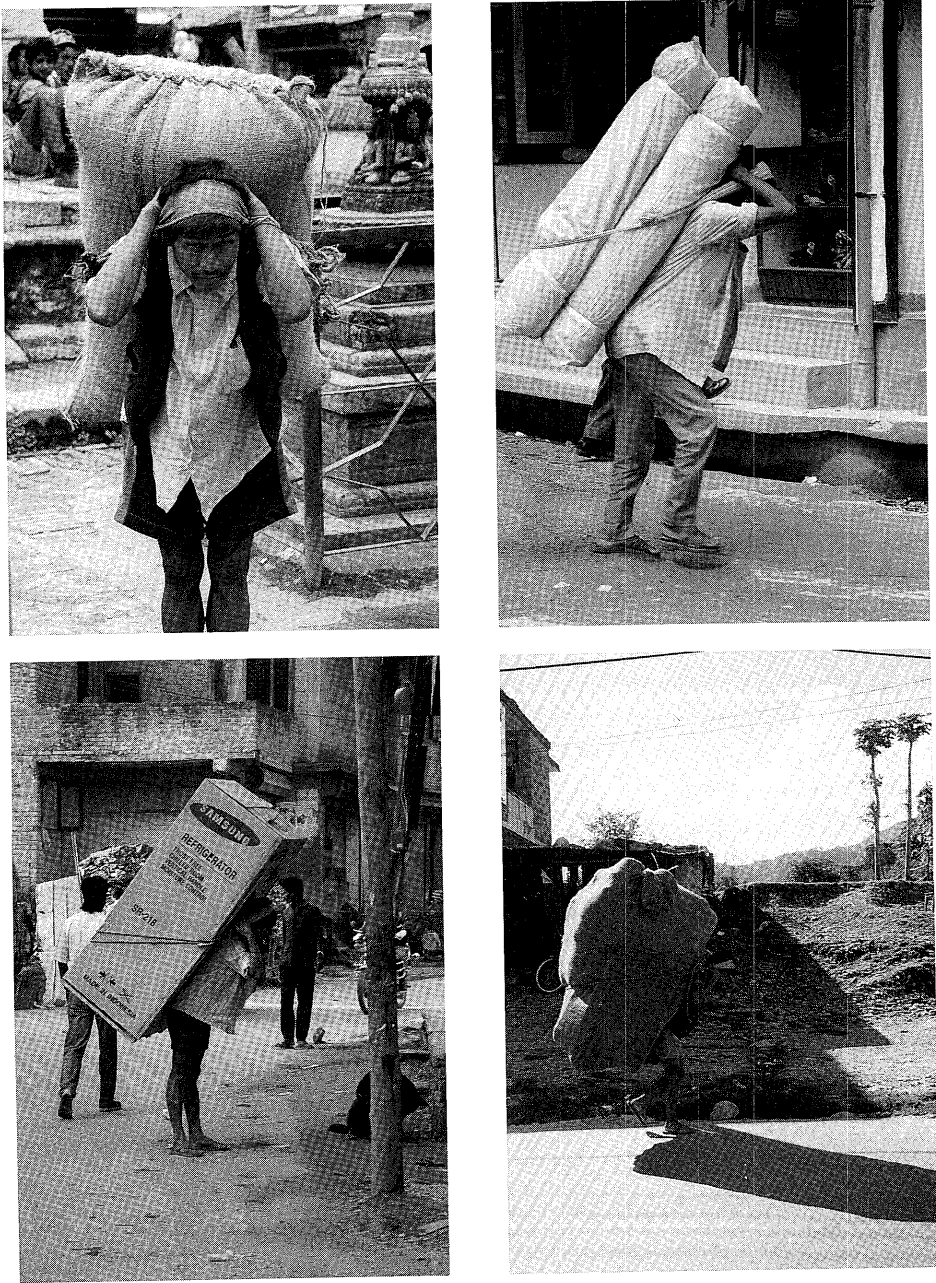


Fig. 4 The carrying styles of various kinds of luggage.

tightly twisted around their waist based on their theological belief that this would give them strength. X-ray examination showed no significant differences ( $P > 0.05$ ) in the vertebral bodies of either the cervical or the lumbar regions of the porters examined in this study (Fig. 5).

Table 1. Constitutional characteristics of Kathmandu porters.

Subject	1	2	3	4	5	6	7
Ethnicity	Tamang	Magar	Tamang	Magar	Magar	Magar	Magar
Age	39	48	38	36	53	46	44
Family (Male / Female)	4/4	none	2/3	3/4	6/5	2/5	11/5
Height (cm)	162.5	148.4	152.2	158.3	165	160.2	168.5
Weight (kg)	54.4	42.2	48.2	51.4	48	50.8	56

Table 2. Diurnal activities and habits of subjects.

Subject	1	2	3	4	5	6	7
Maximum load (kg) individual	110	60- 75	112	100-150	50-60	50-60	60
Maximum weighting (kg) /person <using a handcart>	none	none	none	1000/3	200-400/1	200-400/1	200-300/1
Career length (yr)	8	20-25	6	8-9	20	20-25	25
Type of meal eaten (morning)	Beaten Rice vegetable	dal, bhat	dal, bhat	dal, bhat	dal, bhat	dal, bhat	dal, bhat
Type of meal eaten (evening)	dal, bhat	dal, bhat	dal, bhat	dal, bhat	dal, bhat	dal, bhat	dal, bhat
Daily alcohol consumptio*	2-3 glass	8 glass	1-2 glass	1 glass	1-2 glass	4 glass	4 glass
Tobacco smoking	5-6 sticks	20 sticks	6 sticks	none	20 sticks	20 sticks	20 sticks
Pain reported	Back, Knee, Ankle joints	Knee	Back, Knee	none	caught, asthma	Back	Back

\*1glass=150ml of 45% alcohol

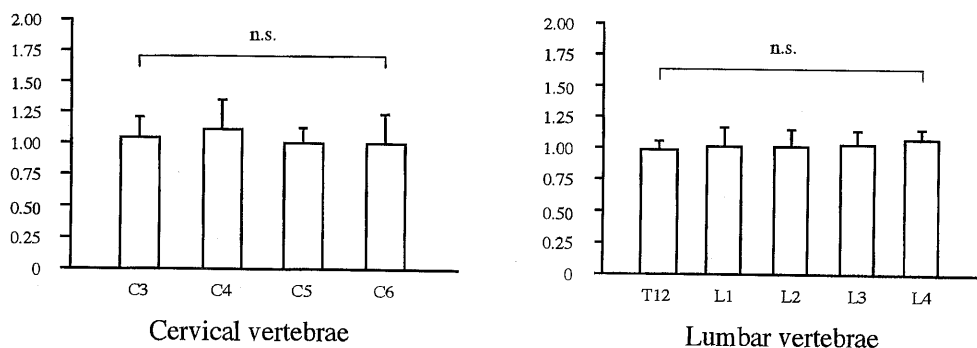


Fig. 5 Values are means ratios of the anterior length of the vertebral body/ posterior length of the vertebral body for each vertebrae. No significant differences ( $P < 0.05$ ) were observed.

## DISCUSSION

*Haulage techniques*

The mountainous nature of most of Nepal restricts the development of vehicular transportation. The Nepalese in the mountain zone have to depend on horses, donkeys or porters for the transport of goods in areas where traffic is not possible. In contrast, the Terai zone does have a traffic service, which includes the bus, the cart, the rickshaw and the taxi, so porters are less prevalent there. Thus the geographical features of the land directly influence the means of haulage and, consequently, the size and shape of loads, as well as the distance travelled.

The four methods of carrying loads (head, cart, yoke, back) observed in this study can be related to geographical and cultural conditions in Nepal. Geographical constraints explain the use of handcarts, which need a wide, flat road or path, and similar shoulder yokes, but only in the Terai zone and some city areas in the Mountain zone. Whereas in the Himalayan zone and most of the mountains, the usual method of haulage was on the back using a tumpline. Free of geographical constraint, people in the Terai zone, preferred to carry loads on the tops of their head. Nepal is a multiracial country with its northern border adjoining Tibet and its southern border, India. The tribes there characterise the Tibet-Burma genealogical chart from north to east and the India-Alien genealogical chart from west to south. The people have different religions, clothes, cuisines and houses. Also, when acting as porters, they carry loads differently, the former mainly on the back using a tumpline and the latter on the back using a tumpline or on the top of the head. It is note worthy that having moved recently from the Mountain zone to the Terai zone, people of the India-Alien genealogical chart or the Tibet-Burma genealogical chart did not change their haulage method from the back using a tumpline to that using the top of the head. Conversely, those moving from the Terai zone to the Himalayan zone did not change from using the top of the head to the back method. It thus appears that the way of transporting goods learnt in childhood, and presumably influenced by geographical features or their living environment, is not altered upon later removal to another geographical area. Interestingly, although the report by Scher (1978) shows carrying loads on the top of the head causes injury to the cervical spine, this method of supporting loads saves the energy (Heglund et al., 1995).

*Diurnal habits of porters in Nepal*

The life expectancy of males is 54.0 years and of females 53.0 years in Nepal. The porters interviewed here were aged 36-53 years.

A porter who does not have any family is very poor and must work in order to live. The income of a porter is extremely low and unstable compared with that of other citizens. They do not wear special clothing and some do not have shoes to prevent slipping and falling during their work as porters.

Carrying luggage on the back using a tumpline puts increased pressure on the cervical and lumbar vertebrae. The increased pressure exerted on the cervical vertebrae would be



applied continuously over long periods of time whilst loads were being carried. Nevertheless, the porters interviewed in this study did not complain of any neck pains. This appears to be because the muscles supporting their cervical vertebrae were very well trained and developed, and this appears to have reduced, if not prevented entirely, cervical vertebrae damage. One possible reason is that the effort and possible risk of injury when hauling loads can be anticipated unlike in athletics, for example, where injury often results from unexpected exertion and accidents. Even if there were some unobserved degenerative changes in the spines of these porters, it would be difficult to prove a causal relationship between occupation and injury, because cervical spondylosis and degenerative intervertebral disks also occur with ageing (Jäger, 1997; Pallis, 1954; Sasaki, 1980). Most of the porters wore a tight cloth band around their waist, in the religious belief they would gain strength by this practice. Less supernatural advantages afforded by the tight binding around the waist would be the lumbar support and the avoidance of lumbago afforded by this practice.

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