Underestimation of malnutrition among Pakistani infants weighed with clothes on*

Arjumand Faisel[1] *and Tauseef Ahmed*[2]

بخس تقدير سوء التغذية لدى الأطفال الباكستانيين الذين يوزنون بملابسهم

أرجمند فيصل وتوصيف أحمد

خلاصة : في العديد من برامج رصد النمو بالوحدات الصحية وعلى صعيد المجتمع في باكستان يوزن الأطفال بملابسهم . وقد أظهر الوضع التغذوي للرضع الذي تم تحديده في مستشفى راولبندي العام ، بوزنهم دون ملابس ، أن حوالي 8% من الأطفال المصابين بسوء التغذية لا يتم تشخيصهم كذلك ، وذلك ينطبق في أغلب الأحيان على الأطفال المصابين بسوء التغذية من الدرجتين الثانية والثالثة . ويتمتع عدد أكبر من الذكور ، على وجه العموم ، بوضع تغذوي أفضل من الإناث . وعليه فقد اتضح أن وزن الأطفال بملابسهم يؤدي إلى بخس تقدير الوضع التغذوي للإناث أكثر من الذكور . ويوصي بالتالي بضرورة وزن الأطفال دون ملابس بغية تقدير حالتهم التغذوية والأخطار التي تتهددهم على نحو دقيـق .

ABSTRACT Many growth monitoring programmes at health facilities and in communities in Pakistan weigh children with their clothes on. The nutritional status of infants at the Rawalpindi General Hospital was estimated from weight without clothes on and showed that about 8% of malnourished children were being missed. This underestimation mostly affected children with grade II and grade III malnutrition. Generally, more boys have normal nutritional status than girls. Accordingly, weight with clothes on was found to underestimate the malnutrition status of girls more than that of boys. Children should be weighed without clothes on so as estimate their nutritional status and risk accurately.

Sous-estimation de la malnutrition chez les enfants pakistanais pesés tout habillés
RESUME De nombreux programmes de surveillance de la croissance de l'enfant dans les formations sanitaires et dans les collectivités au Pakistan effectuent la pesée des enfants tout habillés. Des données ont été recueillies chez des nourrissons à l'hôpital général de Rawalpindi. L'estimation de l'état nutritionnel des nourrissons basée sur le poids sans vêtements a montré que 8% environ des enfants malnutris n'étaient pas reconnus comme tels. Cette sous-estimation concernait principalement les enfants souffrant de malnutrition aux degrés II et III. D'une manière générale, on a observé un état nutritionnel normal chez davantage de garçons que de filles. On a donc constaté que la pesée de l'enfant tout habillé conduisait à une sous-estimation de l'état nutritionnel chez les filles davantage que chez les garçons. Les enfants doivent être pesés sans leurs vêtements pour que l'on puisse estimer correctement leur état nutritionnel et le risque de malnutrition auquel ils sont exposés.

* *The views expressed in this paper are those of the authors only, and do not imply expression of any opinion on the part of their employers.*

[1] *Programme Management Specialist, Office of Health, Population and Nutrition, United States Agency for International Development, Islamabad, Pakistan.* [2] *Senior Research Fellow, National Institute of Population Studies, Islamabad, Pakistan.*

Introduction

The use of height and weight for appraisal of physical and nutritional status began sometime in the second decade of this century in the United States of America [*1*]. It was later introduced in Africa by David Morley in 1960, and became popular in developing countries following UNICEF's call for a Child Survival and Development Revolution in 1983 [*2*].

Over the past decade, growth monitoring of children under five years of age has been practised in Pakistan by many health projects and service institutions. The most commonly used measure is weight for age. One of the authors observed, in growth monitoring programmes at health facilities and outreach services [*3*] and in some training courses for medical officers, that almost all children were being weighed with their clothes on. It was hypothesized that weighing with clothes on is likely to give an inaccurate measurement of weight for age and might lead to underestimation of the degree and severity of the risk of malnutrition to the individual child; this would result in providing inaccurate information to policy-makers and planners.

The purpose of this study was to assess to what extent weighing with clothes on distorts and underestimates nutritional status.

Materials and methods

Information was collected on a few selected child characteristics, including age, sex and weight, first following the normally observed practice of weighing with clothes on and then without clothes. The data were collected at the Diarrhoea Training Unit in the outpatient department of the Rawalpindi General Hospital, Rawalpindi, during the first three weeks of May 1991. The information pertains to infants (aged up to 12 months) who were brought to the hospital for the treatment of diarrhoea. Except for a few, all mothers agreed to let their infants be weighed without clothes. All infants up to 12 months of age, except for those whose mothers refused to have them weighed, were included in the study. The weight of infants was measured using spring balance scales and recorded by a trained lady health visitor (LHV) and a midwife employed by the department.

They were instructed to give special attention to the measurement of weight and accurate recording of infant's age. The measurement of weight (with and without clothes) using spring balance scales obtained a value to the nearest kilogram. Age was recorded from the infant's vaccination card whenever available, otherwise mothers were thoroughly probed for the correct number of months. Age was recorded in running months, for instance, a 45-day old child was recorded as two months of age as the weight was charted in the second block of the growth chart.

Results

A total of 345 infants were recorded of whom 59% were boys. The average of weight with clothes of all 345 infants was observed to be 6.76 kg, and 6.51 kg without clothes. The difference between the two weights remained steady across all ages (Figure 1). The downward shift of the curve on weight without clothes indicates that the inclusion of even minimum summer clothes during the weighing of an infant makes a difference, making infants heavier than their actual body mass. This difference in weight would be much higher in the winter months.

Comparing the distribution of the two weights (with and without clothes), it was observed that the difference in weight ranged from 100 g to over a kilogram, with an average of around 250 g. The difference in weight (with and without clothes) by sex indicated that male children, on average, were heavier than female children by at least 600 g (Table 1). This difference was not much for infants less than four months, but tended to increase with age, especially towards the end of the first year of life. Girls, in general, tended to be of lesser weight than boys and this difference progressively rose with age.

The nutritional status of infants was estimated by plotting weight-for-age data onto the growth chart based on the Gomez classification. For this analysis, subjects falling on the growth curve were included in the grade below it. According to the usual practice of weighing infants with clothes, 69.3% of infants were categorized as having normal nutritional status, and the remaining infants fell into various grades of malnutrition (Table 2). When compared with weight without clothes, a drop was seen in the number who were of normal nutritional status to 61.7%. In addition, almost all malnutritional grades exhibited an increase of 2% to 3%.

Table 1 **Average weight of infants with clothes by sex**

Age (months)	Weight of boys (kg)	Weight of girls (kg)
1	5.05	3.18
2	4.10	4.24
3	4.99	4.58
4	5.68	5.64
5	6.59	5.76
6	6.30	6.12
7	6.91	6.31
8	7.80	7.70
9	7.69	6.79
10	7.78	6.93
11	8.17	8.02
12	8.72	7.93
All	7.01	6.40
No. of subjects	203	142

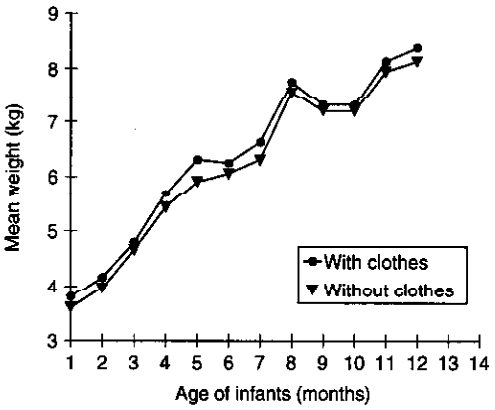

Figure 1 **Mean weight of infants with and without clothes by age**

Table 2 **Nutritional status of infants by weight for age: percentage distribution of nutritional status by weighing with and without clothes**

Nutritional status	Weight with clothes (%)	Weight without clothes (%)	Difference (percentage points)
Normal	69.3	61.7	–7.6
Grade I	16.2	19.4	+3.2
Grade II	8.4	10.1	+1.7
Grade III	6.1	8.7	+2.6
Total	100	100	

In absolute terms, there was a shift of about 7.6 percentage points of subjects away from normal status (weight with clothes) to malnutrition status by weighing without clothes. These subjects were distributed over various grades of malnutrition. In relative terms, the shift means that about 11% more infants were categorized as of grade I malnutrition status. 27% more of grade II status, and 31% more of grade III malnutrition status (Figure 2). Although the number of infants that shifted from one level to the other was small, in terms of proportion the shift added substantially to higher levels of malnutrition status. The significance of accurate measurement of weight is more pertinent to infants at risk.

Analysis of the percentage distribution of nutritional status of infants by sex (Table 3) showed that girls were clothed more heavily than boys, and as such the difference in reduction of normal subjects was more prominent among girls than boys. Therefore, the nutritional status of more girls was underestimated when based on weight with clothes. About half of all girls were categorized as malnourished according to their weight without clothes as against only 30% being classified as malnourished by weight with clothes.

Observation of the mean weight of all infants measured with and without clothes indicated that males categorized as normal

Table 3 **Sex difference in the shift of nutritional status: percentage distribution of infants by nutritional status as determined by their weight with and without clothes by sex**

Nutritional status	Weight with clothes (%)		Weight without clothes (%)	
	Boys	Girls	Boys	Girls
Normal	75.4	60.6	69.5	50.7
Grade I	13.8	19.7	14.8	26.1
Grade II	5.9	12.0	9.9	10.6
Grade III	4.9	7.7	5.9	12.7
Total	100	100	100	100
No. of subjects	203	142	203	142

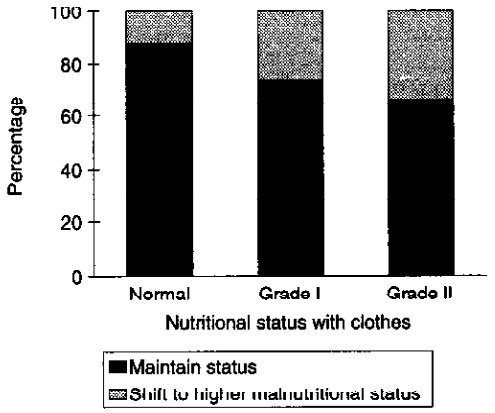

Figure 2 **Percentage of subjects who shifted after being weighed without clothes**

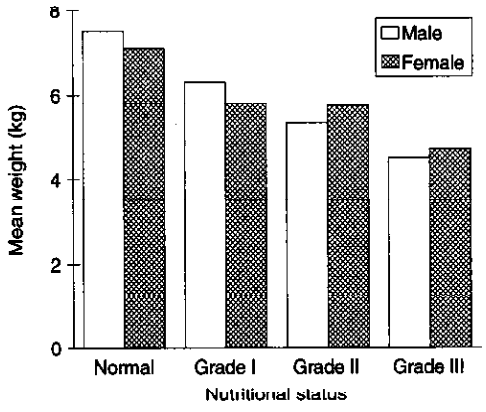

Figure 3 **Mean weight with clothes of infants up to 12 months of age**

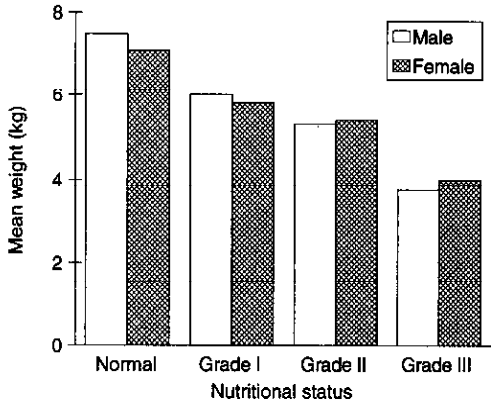

Figure 4 **Mean weight without clothes of infants up to 12 months of age**

or with grade I malnutrition, on average, had slightly more weight than female infants. The sex differential in weight with clothes for grade II and grade III malnutrition did not give a smooth pattern (Figure 3). Only when weight without clothes was considered did the severity of malnutrition emerge, especially at grade III level. Male children were observed (Figure 4) to be of lesser mean weight than girls by about 0.5 kg. This reversal in average weight without clothes between normal and grade III status for males not only highlights the importance of accurate weight measurement but also reveals the existence of really severe malnutrition, especially in male children.

Discussion and recommendations

The importance of measuring weight accurately lies in determining the correct nutritional status of a child, which has a direct bearing on its survival. This exercise helped identify the pattern of nutritional status of infants subjected to two methods of weighing, and examined the degree of shift in nutritional status due to inaccurate measurement.

The exercise challenges the normal practice of health facilities and outreach programmes regarding growth monitoring, which is commonly done by weighing infants with clothes on. It is evident that unless the weight of infants and children is taken without clothes, the information gathered will not provide an accurate measure of nutritional status. This inaccuracy conceals the cases that need urgent dietary and medical care. Continuation of such weighing practices, therefore, would not help in determining growth. The benefit of taking off infants' clothes during weighing applies to both males and females; it helps a health worker to plot the severity of malnutrition accurately and the programme manager to identify the distribution and magnitude of the problems so as to plan interventions accordingly.

Health workers tend to blame parents for not allowing them to take off infants' clothes, especially in the cold season. Such a situation calls for remedial action. During the study it was observed that in the summer month of May, only 1% of mothers refused to take off the clothes of their children when the purpose was properly explained. In winter months an appropriate environment, suitable to infants' needs, has to be created in order to prompt mothers to have their children weighed. Weighing children with clothes on is considered to be a futile exercise for the purposes of growth monitoring.

The findings regarding the shifting of cases from one grade to another are crucial, especially for health workers monitoring the nutritional status of infants and children. It was clearly demonstrated that

weighing children with clothes on conceals the severity of malnutrition in infants, especially of those at higher malnutrition grades. The danger in weighing infants with clothes on is, therefore, the misinterpretation of malnutrition cases, which could significantly delay the action needed and reduce the child's chance of survival. It is imperative to advocate the practice of weighing children without their clothes.

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