The social, family and medical backgrounds of children with kwashiorkor presenting at a teaching hospital

A. A. SIVE, E. F. SUBOTZKY, H. MALAN

Abstract **The social, family and medical backgrounds of 53 children hospitalised with kwashiorkor were compared with those of 106 children hospitalised for non-nutritional diseases to determine risk factors for severe nutritional disease in children presenting to a teaching hospital. The control children were matched for age, sex, race and the non-nutritional illness complicating the course of the children with kwashiorkor; in 80% of cases the reason for admission was either gastro-enteritis or pneumonia. A major difference between the groups was the educational status of the mothers. Only 57% of the mothers of the children with kwashiorkor were literate compared with 93% of the controls; 25% as opposed to 47% were married, and 36% as opposed to 72% received support from the father. There were no differences in the mothers' ages or use of contraception, or in the number of children they had. In all except 1 instance the child with kwashiorkor was the youngest or only child in the family, and the average sibling interval was 53 months. The types of dwellings occupied by the families were similar, but overcrowding was worse in the kwashiorkor group. Family income was below the household subsistence level in the vast majority of both groups, but significantly more of the kwashiorkor group had minimal cash income. Significantly fewer of the children with kwashiorkor had been breast-fed or adequately immunised, and 60% had previously been hospitalised for dehydrating diarrhoea. This study demonstrates that in an urban environment the traditional factors of large families and displacement by a younger sibling are not associated with kwashiorkor. However, children likely to develop kwashiorkor can readily be identified for inclusion in nutritional programmes.**

S Afr Med J 1993; **83:** 180-183.

Protein energy malnutrition is a consequence of a combination of factors.[1] Various studies have reported risk factors for kwashiorkor in different communities,[2-5] but few have documented the prevalence of these factors in well-nourished children living in the same environment. The fact that the number of children with kwashiorkor admitted to our hospital has remained constant over the past few years suggests that risk factors for malnutrition still prevail in the community, but whether there has been a change in prevalence or type of these risk factors over time is not known. The social backgrounds of children with kwashiorkor were last reported from this institution in 1961.[6] Other studies from this hospital have focused on the relationship between malnutrition and infection in patients with gastro-enteritis.[7,8] The aim of this study was to compare the social and medical backgrounds of patients with kwashiorkor admitted to Red Cross War Memorial Children's Hospital with those in well-nourished, age-matched children from the same environment requiring hospitalisation for non-nutritional diseases.

Department of Paediatrics and Child Health, University of Cape Town and Red Cross War Memorial Children's Hospital, Cape Town

A. A. SIVE, F.C.P., M.D.
E. F. SUBOTZKY, M.B. B.CH.
H. MALAN, R. N., B.CUR. (NURSING)

Accepted 13 Apr 1992.

Patients and methods

The study was conducted at Red Cross War Memorial Children's Hospital between July 1989 and December 1990. The infants studied were those admitted on weekdays. The diagnosis of kwashiorkor conformed to the Wellcome classification of infantile malnutrition. For each child with kwashiorkor 2 normally nourished children who were in the same wards as the malnourished children were chosen to act as controls. As far as possible the controls were matched for age, sex, race and any non-nutritional illness that the children with kwashiorkor may have had. In 80% of cases this was either gastro-enteritis or pneumonia. Where kwashiorkor was the sole complaint, patients with viral meningitis or asthma acted as controls.

Mothers who consented were interviewed by one of two clinical investigators (E.F.S. or H.M.) shortly after their child was admitted to hospital. The interviewers had previously standardised their technique. The mothers were questioned regarding the current illness, past medical history, feeding practices, and the family's socio-economic status according to a standard questionnaire.

Data were stored and analysed using a computer and standard methods of statistical analysis.[9]

Results

The study comprised 53 patients with kwashiorkor and 106 controls. Age, race, sex and non-nutritional illnesses are compared in Table I, which shows the equivalence of the groups.

TABLE I.
Clinical details of the patients

	Kwashiorkor (53 patients)	Controls (106 patients)
Age (mo.) (mean, range)	16, 5 - 48	15, 5 - 46
Black	43 (81%)	84 (79%)
Coloured	10 (19%)	22 (21%)
Male	34 (64%)	66 (62%)
Pneumonia	18 (34%)	36 (34%)
Gastro-enteritis	24 (45%)	52 (49%)
Other	11 (21%)	18 (17%)

Family origin

The majority of children with kwashiorkor (62%) lived permanently in the Cape Town area, 25% had recently arrived from Transkei, and the remaining 13% came from rural areas in the western Cape. In contrast, 94% of the control children lived in Cape Town and 5% were from Transkei. The difference between the groups

was significant (χ^2-test; $P < 0{,}00001$). Of the Cape Town residents, 55% of patients with kwashiorkor and 48% of the controls lived in Khayelitsha. The rest were distributed similarly in townships and squatter areas on the Cape Flats.

Housing

Type. Fig. 1 indicates the type of dwelling occupied by the families. A similar percentage in each group lived in shanties or tents. More than half the patients from Transkei lived in traditional kraals.

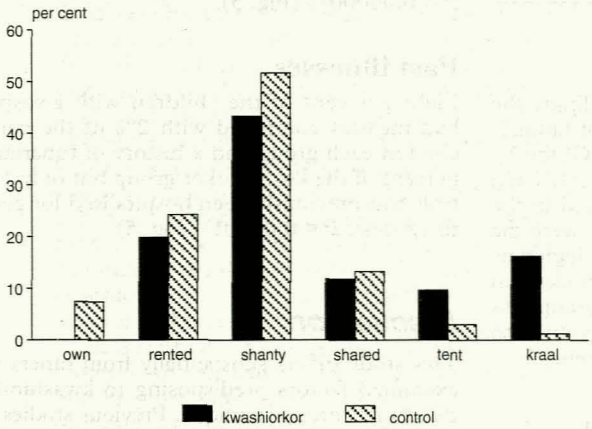

FIG. 1.
Type of accommodation occupied by the families.

Occupational density. There was significantly more overcrowding in the dwellings of the children with kwashiorkor as judged by the number of families that slept more than 5 to a room (χ^2-test; $P < 0{,}0001$) (Fig. 2).

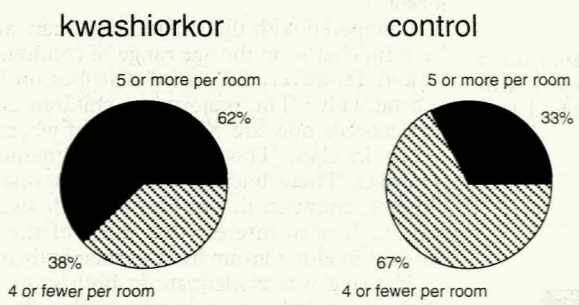

FIG. 2.
Occupational density of the dwellings showing significant ($P < 0{,}0001$) overcrowding in the homes of children with kwashiorkor.

Mothers

Age. The means and ranges of ages were similar for the two groups (kwashiorkor — mean 26 years, range 16 - 43 years; controls — mean 28 years, range 16 - 42 years). Twenty-two per cent of the mothers in the kwashiorkor group were younger than 20 years compared with 14% of the controls, but the difference was not statistically significant (Fig. 3).

Education level. Only 57% of the mothers of the children with kwashiorkor were literate compared with 93% of the controls (χ^2-test; $P < 0{,}00001$) (Fig. 3). However, all the mothers had attended school at some time.

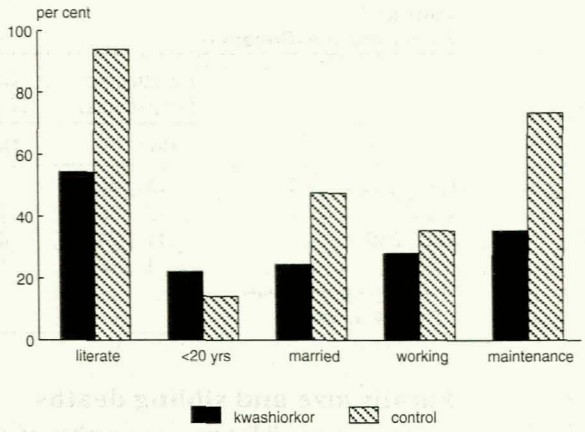

FIG. 3.
Characteristics of the mothers in the study. Compared with the controls, significantly more of the mothers of children with kwashiorkor were illiterate ($P < 0{,}00001$), unmarried ($P < 0{,}005$) and did not receive financial support from the child's father ($P < 0{,}0005$).

Marital status and paternal support. Compared with the control group, fewer of the mothers in the kwashiorkor group were married or if unmarried received financial support from the child's father. These differences were statistically significant (χ^2-test; $P < 0{,}005$ and $P < 0{,}0005$ respectively). A similar proportion of each group were working mothers (Fig. 3).

Nutritional status. The body mass index (BMI) was calculated for each mother by the formula BMI = weight (kg)/height (cm)^2. The normal range is 19 - 24,9.[10] Few mothers were underweight (< 19), but significantly more mothers in the control group than in the kwashiorkor group were overweight with a BMI greater than 25 (χ^2-test; $P = 0{,}01$) (Fig. 4).

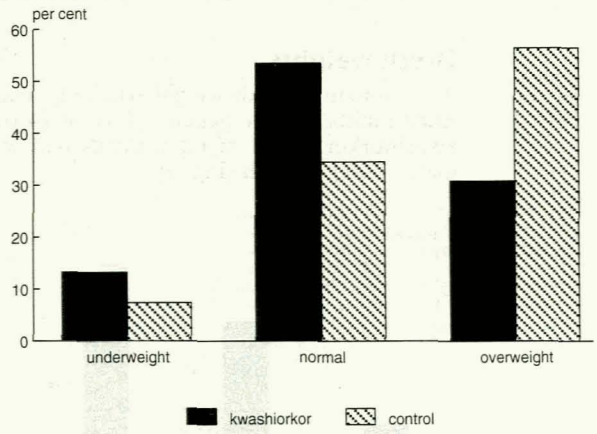

FIG. 4.
Nutritional status of the mothers according to the body mass index (BMI). Significantly ($P < 0{,}01$) more of the control mothers were overweight.

Family income

An estimate of income was possible in 45 cases in the kwashiorkor group and in 97 cases in the control group (Table III). The information was uncorroborated. The vast majority of families in both groups had incomes below R550 per month, which was the household subsistence level for a black family of 5 living in the western Cape at that time.[11] Significantly more families in the kwashiorkor group claimed to have no regular cash income (χ^2-test; $P = 0{,}0001$)

TABLE II.
Family income (R/month)

	Kwashiorkor (45 patients)		Controls (97 patients)	
	No.	%	No.	%
No regular income	18†	40	9	9
< 100	15	33	16	16
100 - 550*	11	24	61	62
> 550	1	2	11	11

* Household subsistence level.
† $P < 0{,}0001$ v. controls.

Family size and sibling deaths

There were no differences in number of siblings, the interval between siblings or the proportion of families that had suffered death of a child (Table III). Of the 53 children with kwashiorkor, 52 were the youngest child (and 21% the only child) in the family; no child in the control group had a younger sibling, and 28% were the only child in the family (Table III). An equally high percentage of mothers in both groups used contraception (Table III). One mother in the kwashiorkor group was pregnant, as opposed to 4 in the control group. In both groups 7% of the mothers had 5 or more children.

TABLE III
Family size, family planning and sibling interval

	Kwashiorkor (53 patients)	Controls (106 patients)
Average no. of siblings, range	2, 0 - 6	2, 0 - 7
Average sibling interval	53 mo.	40 mo.
Siblings subsequent to index case	1 (2%)	0 (0%)
Mothers on contraception	44 (83%)	90 (85%)
Death of a sibling	9 (17%)	16 (15%)

Birth weights

A documented birth weight was only available for a small number of the patients. Five of 14 patients with kwashiorkor and 4 of 62 controls had weighed less than 2 500 g at birth (Fig. 5).

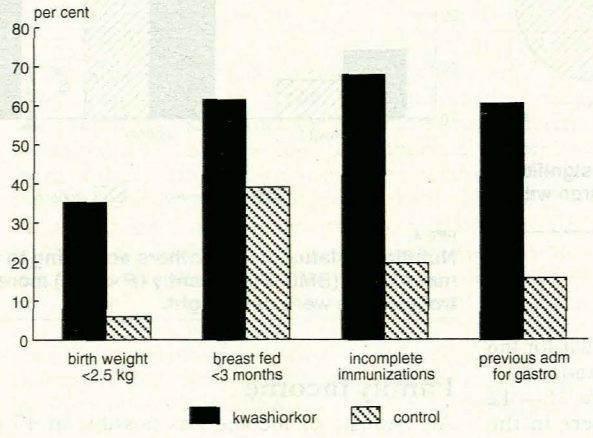

FIG. 5.
Low birth weight, breast-feeding, immunisation and previous hospitalisation for gastro-enteritis. (The sample with documented birth weights was too small for adequate statistical analysis.) Significantly fewer of the children with kwashiorkor had been breast-fed ($P < 0{,}02$) or were immunised ($P < 0{,}000001$), but more had been hospitalised for gastro-enteritis ($P < 0{,}00001$).

Infant feeding practices

Of the patients with kwashiorkor, 45% had never been breast-fed, significantly more than the 24% in the control group (χ^2-test; $P = 0{,}02$). A high percentage of children in both groups had been breast-fed for less than 3 months (Fig. 5).

Immunisation status

Only one-third of the children with kwashiorkor were appropriately immunised for age. In contrast, immunisation was up to date in 80% of the controls (χ^2-test; $P < 0{,}000001$) (Fig. 5).

Past illnesses

Eight per cent of the children with kwashiorkor had had measles compared with 2% of the controls. One child in each group had a history of tuberculosis. Sixty percent of the kwashiorkor group but only 16% of controls had previously been hospitalised for gastro-enteritis (χ^2-test; $P < 0{,}00001$) (Fig. 5).

Discussion

This study differs substantially from others which have examined factors predisposing to kwashiorkor in that the control group is unique. Previous studies have either excluded patients with diseases attributable to socio-economic circumstances[1] or have used non-affected siblings as controls.[6] In this study the controls were normally nourished and in most cases the diseases that had precipitated their admission to hospital were the same as those in the malnourished children — usually gastro-enteritis or pneumonia. Since this was a hospital-based study, the method of selecting controls allowed us to identify factors which were independent of the complicating illness and which may predict children in the family and community at risk of developing kwashiorkor.

Compared with the situation 30 years ago, there has been no change in the age range of children with kwashiorkor. However, the racial distribution has changed substantially.[6] The majority of children admitted with kwashiorkor now are Xhosa, 70% of whom live permanently in Cape Town, while the remainder are from Transkei. These findings clearly show that most of the children admitted to this hospital with kwashiorkor live locally. It is of interest that none of the rural Xhosa patients in either group lived permanently in Ciskei.

Housing was inadequate in both groups, with most of the families living in temporary dwellings. However, the families differed in degree of overcrowding, which may reflect greater poverty and social disruption. Overcrowding is likely to predispose to infectious illnesses such as gastro-enteritis, which was found to be significantly more prevalent in the kwashiorkor group.

Separation of children from their mothers is considered an important cause of anxiety, anorexia and malnutrition in Nigeria,[4] Zaire,[1] Tanzania[3] and Uganda.[2] Geographical separation of child and mother was not a factor in this study; only 1 child did not live with the mother and was looked after solely by the grandmother. However, on the basis of the number of single mothers and the lack of paternal support, family disruption was significantly more common in the kwashiorkor group. This suggests that mothers of children with kwashiorkor are not only financially deprived but also suffer from a lack of emotional support. The absence of a stable father figure may well have long-term psychological implications for the child. The high rate of illiteracy in these mothers — also reported elsewhere — is likely to

disadvantage the mothers and their families further by restricting income and limiting the use of health promotion literature and other resources.

Kwashiorkor has classically been described as 'the disease of the deposed child'[1,2] because the affected child is deprived of the breast when (or in fact before[12]) the next child is born. In our study all but 1 of the children with kwashiorkor were the youngest or the only child in the family and only 1 of the mothers was pregnant. Displacement by subsequent siblings is obviously not a significant factor, but absence of breast-feeding for other reasons is very important. Almost half the malnourished infants were never breast-fed and only one-third were breast-fed for longer than 3 months. This differs substantially from the control group and supports findings in other studies.[6,2,4] Initially an attempt was made to assess the weaning diet and to obtain a dietary history for the children in this study. The details proved difficult to elicit, but suggested that the diets in the kwashiorkor group were grossly inadequate. A formal study to examine differences in diet between patients with various forms of malnutrition and controls is warranted, since Gopalan[14] has reported that in an Indian community the dietary pattern of children who develop kwashiorkor or marasmus is qualitatively similar to that of other children in the community.

In an attempt to assess the nutritional state of the mothers we calculated their BMI. The mother's nutrition may well affect birth weight or breast-feeding, but our impression was that mothers of children with kwashiorkor do not usually look emaciated. Only a small number of mothers in both groups were underweight. The majority of the control mothers were either overweight (BMI > 25 - 29,9) or obese (BMI > 30),[10] whereas most of the mothers of children with kwashiorkor were in the normal range. This suggests that the weight distribution of the population in this study is shifted to the right compared with published standards and that the mothers of children with kwashiorkor may well be underweight for the norms of the community. Alternatively, the increased weight in these women may not indicate adequate nutrition but reflect an unbalanced, carbohydrate-laden diet.

Large families with short sibling intervals are believed to be a common setting for kwashiorkor.[3] Our study clearly demonstrated that this is not the case in our urban environment; family size was not unduly large and the sibling intervals were similar in the two groups. An equally high percentage of mothers attended family planning clinics. Furthermore, sibling deaths, which could influence the interval between children, did not differ between the groups.

It is clear that in both groups family income was grossly inadequate. In the vast majority of cases it was substantially below the Household Subsistence Level for 1990.[11] In other African states[2,12,4,3] extreme poverty in families is associated with kwashiorkor. In the previous study from Cape Town,[6] the poor economic circumstances in the homes of children with kwashiorkor were identical to those in the control population. Superficially, the findings of the current study are similar. However, significantly more of the kwashiorkor families claimed to have no cash income and in over 60% the income was less than R100 per month. These findings suggest that families suffering abject economic deprivation can be overlooked if a single index of economic status is used.

The low rate of immunisation in children with kwashiorkor is similar to findings from elsewhere[3,12] and indicates poor attendance at primary care clinics. In contrast, a high percentage of the mothers used the family planning service. There may be a number of reasons for the discrepancy in the utilisation of different services, but the finding does suggest that to maximise mothers' exposure to primary care, maternal and child health services should be combined and run in tandem.

Even though the numbers are small, the high proportion of children with kwashiorkor who had been of low birth weight is striking. A study in Jordan[15] showed that low birth weight was significantly associated with subsequent malnutrition but not specifically with kwashiorkor. Findings from Cape Town are similar.[16] A significant number of children who presented with gastro-enteritis and who were below 80% of expected weight for age had weighed less than 2 500 g at birth. A high incidence of gastro-enteritis as a prelude to kwashiorkor is well described here[6] and elsewhere[17,18] and is confirmed in this study. Sixty per cent of our kwashiorkor patients had previously been hospitalised for dehydrating diarrhoea, and it is probable that even more had had diarrhoea that did not warrant hospitalisation. Tuberculosis did not seem to be more common in the children with kwashiorkor.

From the data presented it is reasonable to conclude that children with kwashiorkor presenting at this teaching hospital are predominantly peri-urban, living in overcrowded shanties in circumstances of extreme poverty. Their mothers are single and poorly educated, but they do make use of the family planning services. The child with kwashiorkor is likely to be the youngest in a well-spaced, average-sized family, but was of low birth weight and is unlikely to have been breast-fed or adequately immunised. A child fitting this description who presents with dehydrating diarrhoea is at extremely high risk of developing overt kwashiorkor. Urgent nutritional rehabilitation is needed. Ongoing care and preventive strategies should correct the circumstances predisposing to malnutrition.

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