

glossectomy as described by Upadhaya and Rao(3) can also be utilized with advantage for all procedures on the anterior two-thirds of the tongue. Use of non-crushing bowel clamps as described by Robinson(4), placed at the root of the tongue is cumbersome and is often ineffective in controlling bleeding during surgery.

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## Nitroblue Tetrazolium Test in Protein Energy Malnutrition

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Nutritional status, immune response and infection are related intimately. Undernutrition is known to cause fall in cellular mediated immunity. This is ascribed to the altered metabolic activity of polymorphonuclear cells (PMN) resulting in their diminished microbicidal capa-

city(1). Nitroblue tetrazolium test (NBT) is well documented method of assessing the intraneutrophilic metabolic function(2). An attempt has been made in this study to assess the significance of NBT test in protein energy malnutrition (PEM).

## Material and Methods

Fifty children with PEM and twenty five healthy children formed the study group. They were grouped as follows:

*Group A:* Twenty five, normal healthy children, age and sex matched formed the control group. Complete clinical examination, total leucocyte count (TLC), absolute neutrophilic count and NBT test were done.

*Group B:* Twenty eight cases of marasmus forming this group underwent similar screening.

*Group C:* Twenty two cases of kwashiorkor formed the third group. Presence of overt infection was ruled out by clinical and laboratory examination in all children. NBT test was done by the method described by Park *et al.*(3). NBT score was expressed as percentage of positive neutrophils. The absolute NBT score was estimated from total and differential leucocyte count. Statistical analysis was done by 't' test.

## Results

The observed TLC in children of Groups A, B and C were 9340/mm<sup>3</sup>, 8964/mm<sup>3</sup>, and 9604/mm<sup>3</sup>, respectively. The difference was statistically not significant ( $p > 0.05$ ). The percentage and absolute NBT score in the three groups is shown in Table I. NBT score in marasmus and kwashiorkor was comparatively low (mean 4.35 and 2.28%, respectively). The difference

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TABLE I—Percentage and Absolute NBT Score

Groups	Range	NBT % score		Absolute NBT score	
		Mean	SD	Mean	SD
A	5-9	7.28	1.80	345.30	48.61
B	2-8	4.35	1.42	184.40	69.18
C	1-4	2.28	0.02	100.52	13.03

between Group A and C was significant ( $p < 0.001$ ). However, no significant difference was observed between Groups A and B ( $p < 0.05$ ).

### Discussion

From the time of its introduction into clinical investigation, NBT test has generated great interest amongst clinicians, pathologists, and immunologists. There have been many studies on the leucocyte functions in children with PEM, with varying results depending on the methodology adopted(3-6). In the present study, no significant alteration was observed in TLC, an observation similar to study of Shousha *et al.*(6). In a related study(4), it was observed that the response to infection in the form of leucocytosis was inadequate in kwashiorkor. The NBT score was reduced in PEM, and was significantly low in children with kwashiorkor. Though similar inference has been drawn in another study(6), the factor of infection was not excluded. This is important, because infection *per se* can reduce the cellular immunity and cause low NBT reduction. Contrary to this, Rosen *et al.*(4) did not observe any difference in NBT reduction between healthy and PEM children.

It can be surmised from the different studies that NBT reduction, a measure of intraneutrophilic metabolic and enzymatic function is impaired only in cases of severe

PEM. Further, this study confirms that undernutrition *per se* depresses leucocyte function.

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