নৃবিজ্ঞান পত্রিকা, সংখ্যা ১২ পৃ : ১২৯-১৪১

"Anthropology of Health and Epidemiological Transition: The Pathophysiology of Chronic Degenerative Disorders"

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1. Introduction

The increasing involvement of anthropologists in health issues has recently intensified debates concerning the substantive contributions to be made by this discipline and the types of strategies to be encouraged by its professionals in the promotion of culturally appropriate public health program. It is increasingly being recognized that the use of anthropological know-how in health care and nutrition intervention planning may be particularly rewarding, more importantly for those that seek to incorporate participatory strategies in their designs and implementation. The essence of anthropological planning in health or developmental activities is that indigenous culture, not exogenous sources, may provide the framework for model building which makes possible for adoption of innovations aimed toward directed behavioral complex, community participation seems more important than the machinery of organization, and the choices must be from within.

Over the past decade anthropologists and epidemiologists have begun to characterize their concerns on culture change and stress, social stratification, and the unpacking of other social and cultural variables (Trostle and Sommerfeld 1996). A central feature of modern human existence is the phenomenon of culture change. It entails large-scale transformations in the whole cultural fabric and imposes profound changes in the human's way of life. Such a developmental breakthrough endows its population with a new level of adaptive capacity that tends to interact with behavioral patterning, nutritional balance, and the degree of

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physical activity. The altered conditions are not entirely beneficial, for some intrinsic aspects of urban lifestyles often act adversely on the physiological mechanism in populations undergoing transition, leading to a considerable change in health status. An important aspect of this change is the emergence of new disease patterns. The communicable, infectious diseases, a characteristic feature of rural environment, are initially increased, then replaced in phases by potentially fatal, degenerative disorders with the gradual progression of urbanization. This complex alteration in the pattern of health and disease is conceptually characterized as the 'epidemiologic transition', which as a process coincides broadly with the degree of modernization of a society (Omran 1971, Corruccini and Kaul 1983, Bodley 1982, Adams and Smouse 1985, Hunt and Mattingly 1998, Lilienfield & Stolley 1994). The paper here analyses the anthropological viewpoints of health with emphasis on the epidemiological shifts in disease pattern leading finally to the emergence of the chronic degenerative disorders of diabetes and hypertension.

2. Paradigmatic shifts in health studies

Until very recent times, the problem of coping with health disorders has been the chief concern of medical science and its practitioners. From bio-medical point of view, health problems indeed represent physiological abnormalities, and their defining characteristics refer to biologically constructed processes, which can be diagnosed with reference to criteria that are amenable to clinical analysis in western medical terms. This biologistic perspective has been the most important aspect of modern medical system and the major part of a physician's training is directed to biological examination of body functioning and disease. Health professional working within this framework tend to focus upon the causes of a set of measurable and clinically verifiable symptoms, called 'disease' and the unit of analysis is the individual organism or patient itself (Choudhury 1981; Pelto and Pelto 1970). The remedies are sought within the narrow limits of an individual's context in which such disorders arise. One practical implication stemming from this biologistic approach is that the primary component of disease control program for a long time has been organized along hospital-oriented curative system. Despite invaluable contributions made by modern-medical science in the understanding of the molecular and patho-physiological basis of complex human diseases, such a framework could hardly solve the crucial paradox as to why and under what circumstances patterns of health and disease in a population undergo alteration. It is growingly recognized that alterations in the health pattern in a population is deeply embedded with

the behavioral attributes of the people in question. Furthermore, it suggests that any significant deviation in the prevalent pattern of adaptation involving dietary behavior, physical activity load, working stress duress, etc. are likely to be affected by health maladies being triggered by genetic changes in predictable directions.

Ever since health became a matter of public concern as well as a topic of empirical inquiry in social sciences, there has been a substantial shift in analytic paradigms dealing with both causative aspects of disease. Two distinctive trends in this regard are particularly noteworthy. One is 'epidemiological approach' and the other is known as 'ethnomedicinal perspective. Ethnomedicinal approach emerged in recent years is an outgrowth of intensive anthropological research in the cultural context of health problems and health behavior in both traditional and transitional societies. It involves the study of the relationship between cultural content and behavioral patterning on the one hand and health problems arising from such practices on the other (Pitt 1976, Hossain and Choudhury 1986). The goal and epidemiological research is to elucidate etiological factors (risk factors) involved in a disease incidence and to determine its distribution in time and space.

Epidemiological approach as a research paradigm searches for determinants of health related status and events in a population and applies this knowledge to the prevention of diseases. In its emphasis on population variation in incidence and occurrence an epidemiological approach contrasts with clinical investigations, the latter drawing interferences from the facts observed in the examination of individual patients. In such inquiries, researchers create quasi-experimental context to test hypothesis without an attempt at experimental alteration of environmental factors (Chen et al. 1980; Brokenshaw et al 1980).

3. Epidemiological shift in disease patterns

The theory of epidemiological transition has been articulated at many levels of analysis. Omran (1971) sets forth this theory within the conceptual framework of the demographic transition model. The demographic transition theory, a predominant body of thought in social demography, explains changes in the population growth pattern with reference to natality change as affected by socioeconomic modernization. It focuses on the complex change in patterns of health and disease and on the interactions between these patterns and their demographic, economic and sociologic determinants and consequences. An epidemic transition

has paralleled the demographic and technologic transition in the now developed countries of the world and is still underway in less-developed societies. The process of epidemiological shift often begins with increasing distribution of diabetes, ulcer, and hypertensive disease, and eventually culminates in stroke, cancer, and several other kinds of complex cardiovascular diseases. The contemporary western industrialized nations have already reached the pervasive phase of this transition, in which the above fatal chronic disorders impose a significant burden of the total mortality and morbidity (Butler et al. 1982, Harris 1982, Kannel 1982, Kannal and Sorlie 1975, Gerber and Madhavan 1980, Merson & Mills 2001).

The population transformation, according to this theory, occurs as a result of shift from high birth and high death rates, typical of pre-industrial societies, to low birth and low death rates, a usual pattern of modern industrialized societies (Stolnitz 1964, Beaver 1975, Weinstein 1976, Duza 1977, Estroff 1997, Gordon 1990). Omran formalized the notion of disease transition in terms of the three stage model of demographic evolution of a society: the first stage is known as the '*Age of Pestilence and Famine*' that characterizes most traditional societies, Demographically, this phase corresponds to a condition of high fertility and high mortality. The intrinsic low rate of natural increase that follows from this condition perpetuates sustained population growth. The next stage of epidemiological transition is viewed as an '*Age of Receding Pandemics*' that tends to occur in the modernizing phase of a society. "The decline in mortality that comes with epidemiological transition widens the 'Demographic gap' and hence affects demographic change by bolstering population growth" (Omran 1971: 526). During this developmental stage, birth rates continue to remain high, while death rates fall significantly as a consequence of medical intervention in the health care system.

The final stage of epidemiological shift is described as the '*Age of Degenerative and Man-made Diseases*', as exemplified by the present modern, industrialized nations. This phase marks a return to demographic stability occurring from both reduced fertility and mortality and mortality rates. Omran, by using longitudinal data for the period from 1843 to 1970, a period during which the western populations were in demographic transition, demonstrated decreases in infectious diseases and a marked increase in intensities of selection for chronic diseases.

Omran claims:

> "During the transition, a long term shift occurs in mortality and disease patterns whereby pandemics of infection are gradually displaced by degenerative and man-made diseases as the chief form of mortality and the primary cause of death" (1971: 516).

In a recent formulation, Adams and Smouse (1985) further elaborated the theme. Based on Swedish demographic data, they attempted to show how changing vital rates might influence the genetic structure of a population, particularly as it related to 'genetically mediated diseases'. The authors cited two factors that, in their views, tend to influence the selection against degenerative diseases. These are: the lowering of mortality rates and a reduction in 'generation times' emerging from altered 'age specific fertility' rates. Different population groups today differ in genetic endowments, which probably arose from the long-term effects of bio-demographic evolution. This notion is assumed from the observed variability of certain chronic diseases such as diabetes mellitus, hypertension, and cardiovascular disorders between different ethnic groups, especially between traditional and Western societies, Accordingly, Such conditions are often designated as genetic syndromes of New World populations (Siervogel 1983).

An early version of this theory implicitly suggests that the disorders of diabetes and hypertension are unique to modernized western societies due to increased accumulation of genetic load against such diseases or 'bad genes'. This has led many scholars to characterize such disorders as 'Western Diseases' or 'Diseases of Civilization' (Clegg and Garlick 1980; Levine et al, 1980; Trowell and Burkett 1980; Mattingly & Garo 2000). Based on inductive reasoning, it is further concluded that the non-western populations are 'genetically immune" from chronic diseases, protected by their differential pattern of demographic cum biological evolution. The part of the explanation is that humans have adapted to a stable pattern of socio-cultural life ways from time immemorial, which produced a particular configuration of biologic system in keeping with that adaptational mode, namely, lower energy intake (restricted dietary behavior) in relation to high-energy expenditure (hard physical labor), lesser neurological stress in work condition. Rapid departure from such a long established behavioral pattern stemming from urbanized life ways will have inevitable impact in causing a change of disease pattern from infectious mode to a genetically fueled 'degenerative' mode.

4. Pathophysiology of diabetes and hypertension

Attempts to generalize in this manner illustrate a classic paradox in the epidemiological study of diabetes and hypertension in Third World societies, where the predicted changes in the health status is already underway within a relatively short span of time. While the hypothesized link between demographic transition and epidemiological shift has wider applicability to the western countries, but the appropriateness of this model for non-western populations has been seriously questioned in recent years (Corruccini and Kaul 1983; Helman 1994; Hunt and Mattingly 1998). It is now increasingly recognized that the modernization process alone can bring about alteration in the disease pattern independent of any natality change. Studies in different parts of Asia, Africa, the Pacific and Caribbean Islands provide strong support to the observation that there are no ethnic or racial groups which are inherently immune to rises in blood pressure (hypertension) and blood glucose (diabetes), once they are exposed to the deleterious urbanized life ways. Evidence is accumulating that diabetes; hypertensive and cardiovascular diseases are assuming predominance as health hazards among the acculturated urban populations of many so-called traditional societies. This pattern is consistently present in almost all the transitional societies of today across all continents (Zimmet 1979; Hornick and Hanna 1982; Beaglehole et al. 1977; Martin et al. 1982; Swedlund 1990; Gavin et al 1998). Countries like India and Bangladesh which have experienced an accelerated pace of urbanization only in recent decades provide the best documentation of this observation (Arora and Bordia 1974; Ibrahim et al. 1985; Ali et al. 1985a; 1985b, Malik 1976; Good 1994; Lilienfield & Stolley 1994).

The fact that diabetes and hypertension are quite low among rural populations but increase when they adopt an urban way of life suggests the overwhelming importance of the environmental transition in disease causation as opposed to the selectionist forces envisaged in the genetic postulate (Choudhury 1981). The low occurrence of these chronic conditions among the unacculturated spectrum of a population can be attributed to their 'archaic' adaptational pattern inherent in rural life ways. A sudden departure from the bondage of this adaptive system, even within the time-frame of one generation, may eventually lead to the pathogenic developments of these conditions (O'Dea et al. 1974, 1975, Keil et al. 1980, Page et al. 1974, Janzen 2002, Pilsbury 1992). It is

inconceivable that some kind of genetic change could have triggered the process; rather, far more likely, rapid changes in lifestyles accompanying urbanization constitute the proper source of disease transition. Corruccini and Kaul emphatically claim: "The change is too rapid to allow consideration of explanatory models of genetic adaptation or mutation" (1983: 37). It is particularly striking that countries with the clearest indications of a rise in diabetes and hypertension are the most rapidly developing nations. In view of the extreme distribution of these degenerative conditions in such countries, it would be more appropriate to redesignate these diseases as the 'disorders of acculturation'. This also brings into question the assessing of the extent to which one can generalize from the experience of the western developed nations (Johnson 1990, McElroy et al 1991, Geest & Reynolds 1991).

The clinical conditions of diabetes mellitus and hypertension represent heterogeneous collections of traits. For a better understanding of the pathophysiological basis underlying these conditions, some qualifications of the parameters of diabetes and hypertension are necessary. Such definitions are derived herein from the criteria that are amenable to clinical diagnosis in western bio-medical terms. There is general agreement today that the conditions of diabetes as well as hypertension are characterized by continuous variation in clinical, biochemical, and molecular phenotypes, and that multiple genotypes may give rise to the same conditions.

5. Search for a new perspective

The research in the area of epidemiology of diabetes and hypertension has generated a considerable body of literature. Despite great advances in understanding the pathophysiological and biochemical aspects of these degenerative conditions, there is still great controversy among scholars on the causal mechanisms that produce diabetogenic and hypertensivogenic phenotypes. The divergent viewpoints in the whole range of works reveal theoretical fragmentation of research along certain distinct lines of reference. Broadly speaking, the following three kinds of explanatory models are currently in use in the epidemiological study of diabetes and hypertension: (a) The genetic causation theory, (b) The genotype-environmental interactions theory, and (c) The environmental transition theory. The present section provides a review of the logical and empirical status of the above theoretical paradigms with emphasis on the pertinent issues raised in these perspectives.

(a) Genetic Causation Theories

For a long time, a genetic mechanism has been strongly implicated in the pathogenesis of many chronic diseases including, diabetes and hypertension. These two types of conditions are particularly viewed as typical examples of degenerative diseases whose proximal pathology tends to be genetic in origin. The considerable variability that exists today in the distribution of blood pressure and blood glucose among various ethnic and racial groups is attributed to the genetic endowments of certain population groups. It has been observed that Western populations as a whole shows higher prevalence of diabetes and hypertension compared to non-Western populations. Also, the black populations of the United States display more extreme distributions of blood pressure in comparison to their White counterparts within the United States (Keith et al. 1939). Contrarily, the blacks of Africa, the parent populations of the contemporary blacks of the United States, continue to show a genetic immunity to diabetes and hypertension. Observations of these sorts have led some scholars to argue that Western populations have accumulated the detrimental genes for these diseases over time through mutations end selective forces (Lynn et al. 1967, Miall 1967, Schull 1977, Rushforth et al. 1971, Ostfeld and Shekelle 1967, McElroy & Townsend 1996). This genetic postulate rests on the assumption of genetic deterioration (biochemical effects of genes) operating through the mechanism of selection that led to an increased occurrence of diabetes and hypertension in modern Western societies (McElroy & Townsend 1996, Gopalan, Sastri, Subramanium 1978).

Attempts to understand the genetic basis of diabetes and hypertension have met with the question of empirical validation. The findings in this respect are still inconclusive and at times are contradictory. Geneticists customarily spend little time in demonstrating familial aggregation before proceeding to identify the mode of causation. Quite often, the involvements of non-genetic factors are ruled out in the process of segregation analysis. An essential limitation of such an approach is the difficulty of inferring from purely observational studies, which would require an experimental research design. The hypothesis of a bimodal distribution of blood pressure and blood glucose that would point to a major gene difference was refuted for many populations (Chrisman & Maretzki 1982).

(b) Genotype-Environmental Interactions Theories

The past decade has also seen the proliferation of a relatively new explanatory model, known as 'genotype-environmental interactions' theory. This approach, more popular in genetic epidemiology, envisages disease etiology in a continuum. At the one end of the continuum are infectious diseases that originate from 'Environmental insult', while the other end includes those diseases that are purely genetic and arise regardless of where an individual lives. Diseases like diabetes and hypertension are viewed to originate from the middle point of the etiological spectrum between purely environmental and purely genetic disorders (Roberts 1983, 1985, Chakraborty and Szathmary 1985, Weiss 1985). Researchers using this perspective postulate an interaction between genetic predisposition and deleterious environmental conditions in the pathogenic occurrence of the diabetes and hypertension. As a point of departure from the conventional genetic model, an emphasis is placed on multifactoral etiology implicating genetic model, implicating genetic polymorphism and multiple environmental factors. It is contended that ultimate expression and clinical variability of such diseases are governed by specific environmental determinants that tend to interact with varying degrees and types of inherent 'susceptibility'.

The clinical manifestation depends to some degree on variations in the environmental circumstances to which individuals with the abnormality are exposed. The genetic epidemiologists suggest that many of the individuals acquire these traits in 'high risk' societies, given the exposure to certain deleterious life-styles (Taylor et al. 1982, Stern et al. 1983, Hanna and Baker 1979, Cruz-vidal et al. 1984, Swedlund 1990, Gavin et al 1998). The adherents of this viewpoint argue that the significance of this interaction becomes more evident when the intra-population variability (within population) with regard to the distributions of diabetes and hypertension is taken into account. Family clustering accounts for a larger share of this variability within a given population, which in their views is the effect of susceptibility genes in association with certain environmental factors such as physical indolence, over-eating, and excessive adiposity. However, when this variability is examined at the inter-population (between) level, the relative primacy of environmental factors becomes more distinct in the distributions of elevated blood pressure and elevated blood glucose.

(c) Environmental Transition Theories

Intensive epidemiological surveys on groups of people living in diverse social environments are now producing convincing evidence for a relatively new theoretical formulation. Over the recent years, it has been observed that populations still living in a traditional type of social setting tend to show a remarkably low and uniform pattern of blood pressure and blood glucose traits; and more characteristically, neither of these traits exhibit a rising trend with advancing age (McGarevey et al. 1980, Cassel 1975). This pattern in physical disposition continues to hold despite a high degree of inter-population variability in morphological characteristics. In other words, when the environmental inputs are controlled, there seems to be a negligible variability in blood pressure and blood glucose distributions across a wide variety of genetically distinct populations. On the contrary, the more and unacculturated population moves away from traditional life ways, one endured for a long time, the more inter-population variability in the prevalence of hypertension and diabetes begins to accumulate.

Findings of this nature suggest that the potential determinants of these degenerative conditions are likely to be major constellation of socio-cultural and behavioral factors associated with environmental changes (McGarvey et al. 1980, Corruccini and Kaul 1983, Marmot 1980, Stamler et al. 1967). Hypertension and diabetes as major health problems, by and large, make their appearance and increase in frequencies in societies undergoing modernization and urbanization. Various intrinsic aspects of acculturated lifestyles, emerging thereof, tend to pose risk for the alteration of health status and the pattern of morbidity from chronic diseases --- a theoretical construct, referred to as the 'environmental model of causation'. Recent cross- cultural comparisons validate such a hypothesis on strong correlation of degree of urbanization and culture change with the increasing distributions of blood pressure and blood glucose values in a society (Cassel 1974a, 1975, McGarvey et al. 1980, Corruccini and Kaul 1983, Marmot 1980, Stamler et al. 1967, Stamler (1980), Cohen 1989, Reff 1990, Oliver-smith 1995).

The environmental causation of diabetes and hypertension is increasingly being supported in numerous studies, carefully conducted in genetically controlled research settings, One kind of research strategy that has turned out to be useful in establishing environmental theory consists of migration studies. The rapid acquisition of a high degree of these disorders by rural migrants within a relatively short span of urban living,

which has been observed in some studies, provides unequivocal empirical proof of the paramount role of environmental factors in the shift as opposed to the genetic explanations (O' Dea et al. 1980, Ostfeld and Shekelle 1967, Page et al. 1974, Cruz-vidal et al. 1979). That these differences are due to the operation of environmental mechanisms is indisputable, in so far as the possibility of any mutational or selective change within this short time frame is highly unlikely. Findings are also suggestive of the fact that a reversion from such physiological abnormalities to normality is quite possible through considerable alterations in lifestyle. The Australian aboriginals provide examples of such reversion in their metabolic glucose response after having switched back to the original ancestral mode of living. In fact, a key activity today in planning of prevention programs in both diabetes and hypertension includes restriction of certain aspects of lifestyle that have been rewarding in the management of normal health (Arky 1982, WHO 1980, Anderson 1981, Sharp 1974). Many clinical patients having these acute conditions have been able to maintain a fairly good health status through preventive measures without resorting to medication intervention.

6. Epilogue

There has been a notable shift in the pattern of health and disease in the modernized sector of the society. Chronic diseases life hypertension and diabetes, once infrequent in this group, are assuming gravity as a potential source of morbidity in the urban environment. This complex alteration in the nature of health reflects, by and large, the importance of environmental involvement in disease mediation. Socio-cultural risk factors appear to be the key predictors of these degenerative syndromes. An intensive investigation into a selective range of cultural-environmental factors in any fast changing social context will reveal that some key attributes are pervasively linked to a transition in the health pattern among a population group. These etiological factors include fast change in dietary pattern (high calorie intake from carbohydrates, fat and animal protein), reduced physical activity (as a result of change to a sedentary occupation), and neurological stress embedded to urbanite life.

Having focused on such attributes, outlined above, that have relevance to functional adaptation of the population, it has been possible to make a useful distinction in environmental parameters and disease traits in a genetically controlled research setting. If the observed differences in blood pressure and blood glucose between the control and the experimental group were mainly due to specific changes in behavioral

and socio-cultural factors, there would be no function of genetic mechanism in the given situation. Such disorders tend to predominate when the stage of modern urbanized society is reached. An abrupt departure from well-adapted life ways that this population has undergone seems to have ruptured the biological immunity against degenerative abnormalities.

References

Adams, J. and P. E. Smouse 1985 Genetic Consequences of Demographic Changes in Human Populations. In *Diseases of Complex Etiology in Small Populations*. R. Chakraborty, and E.E. Szathmary, eds. Pp.

283-300. New York: Alan R.Liss.

Brown, Peter J. 1998 *Understanding and Applying Medical Anthropology*. Mayfield Publishing.

Baer, Hans, Merrill Singer, and Ida Susser 1997 *Medical Anthropology and the World System: A Critical Perspective*. Westport, Conn: Bergin.

Brokenshaw, D., D. warren, and O. Warren (eds) 1980 *Indigenous Knowledge System and Development*. Washington: University Press of America.

Choudhury, A. F. H. 2007*Culture change, stress and epidemiological transition in Bangladesh*. Chittagong University Press. Chittagong, Bangladesh.

Choudhury, A. F. H.Culture, Disease, and Environment: An Ecological Study of Health Problems in Rural

Bangladesh. Dhaka: University Grants Commission.

Choudhury, AFH 1990 "Insights into the Crisis in Health Management Systems in Bangladesh: an Ethno-Medicinal Design for Modification of Folk Dietetics". *Chittagong University Studies*, Social Science, Vol XI, No. 1, Pp. 1-14.

Corruccini, R.S.,S.S. Kaul,S.K. Chopra, J. Karosas, M. Larsen, and C. Morrow 1983 Epidemiological survey of Malocclusion in Rural North India. *British Journal of*

Orthodontics 10: 44-47

Corruccini, R.S., and S.S. Kaul 1983 The Epidemiological Transition and Anthropology of Non-infectious Diseases. *Medical Anthropology* 7: 37-50

Estroff, Sue

1997 Introduction: A Cultural Perspective of Experiences of Illness, Disability, and Deviance. In *The Social Medicine Reader*. Hender et al, eds. Durham: Duke University Press., pp. 7-11.

David R. Phillips 1994 Epidemiological Transition: Implications for Health and Health Care Provision. *Geografiska Annaler. Series B, Human Geography*, Vol. 76, No. 2, The Changing Geography of Disease Distributions, pp. 71-89

Foster, George 1982 Applied Anthropology and International Health: Retrospective and Prospect. *Human Organization* 41:189-197.

Goodman, Alan, Darna Dufour and Gretel Pelto 1999 Nutritional Anthropology: Biocultural Perspectives on Food and Nutrition. *Mountain View*, CA: Mayfield Publishing Co.

Helman, Cecil G. 2000*Culture, Health*, and Illness. Fourth Edition. London: Arnold Publishers.

Hossain, Z. and Ahmed F. H. Choudhury 1986 "Humoral Disposition and Dietary Habits of Rural Women in Bangladesh". *Proceeding of the 20th Bengal Studies Conference*, Lake Geneva, USA.

Janes, Craig, Ron Stall, and Sandra Gifford (Eds) 1986 *Anthropology and Epidemiology: Interdisciplinary Approaches to the Study of Health and Disease*. Holland: D. Reidel Publishing Company. (GN 296 A55 1986)

Johnson, Thomas and Carolyn Sargent 1996 *Medical Anthropology: Contemporary Theory and Method.*

John Janzen 2002 *The Social Fabric of Health: An Introduction to Medical Anthropology.* University of Kansas—Lawrence USA.

Johnson, Thomas, and Carolyn F. Sargent, (Eds) 1990 *Medical Anthropology: A Handbook of Theory and Method*. New York: Greenwood Press.

McElroy, Ann and Patricia Townsend 1985 *Medical Anthropology in Ecological Perspective*. Boulder: Westview Press.

McElroy, Ann and Patricia K. Townsend 1996 *Medical Anthropology in Ecological Perspective*. Third Edition. Westview Press.

Omran, A. R. 1971 "The Epidemiological Transition", *Milbank Memorial Fund Quarterly*, 49: 509-538.

Ullah, Wali 1976 Hypertension in a Mixed Community. *Bangladesh Medical Research Council Bulletin* 2(2): 95-99.

Vaishanava, H., and R.C. Bhasin 1969 Hypertension in Indian Diabetes. *Journal of Chronic Diseases* 21(9): 691-702.