The rule of two-thirds in diabetes epidemiology

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ABSTRACT

This communication hypothesises a rule of two thirds which seems to operate in Indian diabetes epidemiology. Two thirds of all persons with dysglycemia are prediabetic; two thirds of all persons with diabetes are diagnosed to have the condition; and two thirds are diagnosed before the age of 50 years. Two thirds of people with diabetes have concomitant hypertension or dyslipidemia; two thirds do not get their HbA1c assessed; and two thirds of those who do, do not achieve target values. Yet, two thirds of people with diabetes report satisfactory psychosocial health and quality of life, and adherence to dietary therapy and medication. Only one third adheres to exercise and self monitoring advice, however. Two thirds of persons on oral glucose lowering drugs receive metformin; two thirds of those on insulin receive premixed insulin or twice daily insulin, and a similar proportion uses pens for delivery. Thus, the rule of two thirds, rather than of halves, operates in modern Indian diabetes practice.

Key words: Epidemiology, India, prediabetes, rule of halves, type 2 diabetes

INTRODUCTION

The rule of halves is well known to researchers in chronic disease epidemiology. Simply put this states that only half of the people living with a chronic disease are diagnosed to have it; only half of these seek treatment, and only half of those being treated achieve optimal targets.¹⁻² Recently, a rule of thirds has been postulated in India thyroid epidemiology.¹¹ Based on data from large Indian studies,¹¹ this hypothesis suggests that a rule of thirds and two-thirds, rather than halves, operate in Indian hypothyroid prevalence. We assess major Indian trials, conducted in recent years, to analyze whether the rule of thirds or halves, is more pertinent to the epidemiology of diabetes [Box 1].

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Prediabetes and Diabetes

The spectrum of dysglycemia is a broad one, encompassing impaired fasting glucose and impaired glucose tolerance (both clubbed as prediabetes) and frank diabetes. Diabetes endemicity indices suggest that if the prevalence of prediabetes and diabetes are similar to each other, diabetes is endemic to a particular area.¹³ However, in a situation where the diabetes epidemic is worsening, the ratio of prediabetes to diabetes will be higher than unity.

Data from Indian Council of Medical Research - Indian Diabetes (ICMR-INDIAB)¹⁰ reveal that this ratio varies across different states. In states and union territories, such as Tamil Nadu and Chandigarh, half of all persons with dysglycemia have diabetes (10.4/18.7 = 55.6%,

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In Maharashtra and Jharkhand, however, a rule of thirds operates. In Maharashtra, $8.4/21.2 = 39.6\%$ of all persons with dysglycemia are diabetic, while in Jharkhand the ratio is $5.3/13.4 = 39.5\%$. Thus, the rule of thirds is more relevant to “developing” states, which are yet to face the full burden of diabetes.

In the Centre for Cardio-Metabolic Risk Reduction in South Asia study, the ratio of diabetes to prediabetes follows the rule of one-thirds in all three cities studied (Chennai, Karachi, and Delhi). The proportion of diabetes to prediabetes was approximately 1:2 (i.e., one-third of total dysglycemia) in Chennai ($22.8\%:37.9\% = 0.61$), Karachi ($16.3\%:31.1\% = 0.52$), and Delhi ($25.2\%:47.6\% = 0.54$).[7]

The Chennai Urban Rural Epidemiological Study (CURES) 10 years long follow-up reveals that almost one-half of all persons with normal glucose tolerance progress to prediabetes or frank diabetes (45.1%) while two-thirds of persons with prediabetes convert to diabetes (58.9%).[8] The high and rapid conversion of prediabetes to diabetes (two-thirds rather than one-half) enhance the importance of the law of two-thirds in Indian diabetes epidemiology.

**DIAGNOSIS OF DIABETES**

Diabetes often remains undiagnosed in developing countries. India, though a developing nation, is at the cusp of a health-care transition. Health-care facilities are improving across the country, and it is possible that the law of halves may not apply to diabetes diagnosis in India. In hypothyroidism, two-thirds of all persons with normal glucose tolerance progress to prediabetes or frank diabetes (45.1%) while two-thirds of persons with prediabetes convert to diabetes (58.9%).[8] The high and rapid conversion of prediabetes to diabetes (two-thirds rather than one-half) enhance the importance of the law of two-thirds in Indian diabetes epidemiology.

Two-thirds of PwDs do not have their glycated hemoglobin (HbA1c) measured even once in the preceding year (71.7%). Two-thirds of all PwDs have concomitant hypertension (66.4%); two-thirds (65.3%) have dyslipidemia, and a similar proportion (65.4%) have some form of peripheral vascular disease.

**COMORBIDITY AND CONTROL**

DiabCare India 2011 is a cross-sectional study which surveyed persons with type 1 and type 2 diabetes being treated at clinics and hospitals across India.[11] Family history of diabetes is absent in two-thirds of all PwDs (61.8%) suggesting that environment may play a greater role than genetics in the growing diabetes epidemic.

Only one-third of participants in DiabCare India 2011 are complication free, without a macro or microvascular complication, and just one-third were treated with insulin. On the other hand, a rule of two-thirds prevails for nonpharmacological management. Almost two-thirds of PwDs report adhering to dietary recommendations (54.5%) and medications (66.2%), but only one-thirds complies with prescribed exercise (37.2%) and self-monitoring (32.9%).

Of the oral antidiabetic drug users, two-thirds (61.6%) are on metformin. At the same time, two-thirds of insulin users (71.1%) use human insulin preparations; two-thirds take insulin in a twice daily dose (1421/2169 = 65.4%), and two-thirds choose pen devices for insulin administration (1422/2169 = 65.5%).

**MANAGEMENT**

The rule of two-thirds applies to psychosocial aspects of diabetes as well. In DiabCare India 2011, 69.9% report feeling “calm and relaxed” all or most of the time. A similar proportion report being “cheerful and in good spirits” (66.0%) all or most of the time, and “woke up feeling fresh and rested” (56.3%) all or most of the time. Two-thirds (68.9%) feel “active and vigorous” all or most
of the time. In all these aspects, the rule of two-thirds applies to diabetes in a positive manner. When asked whether their “daily lives had been filled with things that interested them” however, only one-third respond in the positive (36.2%).

Two-thirds of Indians with diabetes report a positive quality of life. The proportion of persons replying in the following statements: the negative to “I am constantly afraid of my disease getting worse” (59.3%), “I am tired of complying with my medications” (67.6%), “I feel my diabetes is preventing me from doing what I want to do” (65.1%), “I am worried about the risk of hypoglycemic events” (64.9%), “coping with diabetes is more difficult at present than it used to be” (63.3%), and “I feel burnt out from having to cope with diabetes” (65.5%) is two-thirds.

SUMMARY

This collation of facts gleaned from seminal epidemiological studies, reveals interesting facts about diabetes in India. The epidemiology of diabetes in India tends to follow the rule of two-thirds, rather than halves. This understanding will help in proper assessment and analysis of the diabetes epidemic in India.

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There are no conflicts of interest.

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