

Diabetes mellitus and associated diseases from Ethiopian perspective: Systematic review

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Abstract

Background: Diabetes mellitus (DM) is recognized as one of the major non-communicable diseases in Ethiopia. However, the overall features associated with DM are not well documented and updated regularly.

Objective: This paper is focused on reviewing and updating the literature on diabetes mellitus, its features, complications, and associated communicable diseases in Ethiopia.

Methods: The researcher has carried out a systematic review of research papers published from 1970 to 2013 on DM and associated diseases in Ethiopia.

Results and discussion: According to International Diabetes Federation, IDF 2012 report, the prevalence of DM in Ethiopia stands at 3.32 %. However, DM prevalence of as high as 8% has been reported in 2013 on HIV/AIDS patients taking HAART, in Ethiopia. Major DM related complications include: hypertension, neuropathy, and DM foot disease. The prevalence of these diseases has risen from 12.1%, 27.7%, and 1.7% in 1976-1997, to 34.1%, 29.5%, and 4.6 % respectively in 2005 to 2009. On the other hand, retinopathy prevalence looks stable at around 33.3% for long period. On the other hand, the prevalence of infectious diseases such as: UTI, HCV and tuberculosis that is associated with DM reaches up to 17.8%, 9.9%, and 8.5 % respectively. But, no study has been conducted confirming whether DM increases infectious diseases occurrences or vice versa.

Conclusion: DM occurrences and complications have been increasing throughout the country. Thus, the Ministry of Health and other stakeholders need to join hands to prevent and control the prevalence and sufferings associated with DM. Especially, more emphasis should be given to raise the awareness of the general public about the disease.

Keyword: Diabetes mellitus, Ethiopia, DM complications. [*Ethiop. J. Health Dev.* 2013;27(3):249-253]

Background

DM is one of the most common non-communicable diseases, affecting the health of a significant number of the population throughout the world (1). The major characteristic feature of DM is occurrence of fasting blood glucose value greater than 126mg/dl (2). The global prevalence is projected to rise from 171 million in the year 2000 to 366 million in 2030 (3). In Africa, the prevalence of DM is increasing and the magnitude of the disease is progressing (4). In sub-Saharan Africa, over 12 million people are expected to have DM, and 330,000 of these people will die from DM related complications (5). In Ethiopia, according to WHO estimation, the number of diabetics cases in the year 2000 was 800,000 and this number is expected to increase to 1.8 million by the year 2030 (6).

In Ethiopia, although DM is recognized as one of the major non-communicable diseases, the exact prevalence, progress, and associated complications are not well documented and updated regularly. Therefore, this paper is targeted at analyzing the progress of DM in Ethiopia and DM associated complications and infectious diseases seen on DM patients.

Methods

This is a systematic review of electronic journals from pub med, Google, and other search engines from 1970s to

2013. The review was mainly focused on the prevalence of DM, occurrence of DM with other communicable diseases and DM associated micro and macro vascular complications. Of the total reviewed journals, the researcher took inputs from 38 articles and presented his findings as follows.

Results

Prevalence of DM in Ethiopia

In Ethiopia, although a nationwide surveillance on occurrence of DM has not been made, IDF 2012 report indicated an estimated DM prevalence of 3.32 % (7). However, DM prevalence of as high as 8% has been reported in 2013 on HIV/AIDS patients taking HAART (8). On the other hand, a study conducted in Jimma reported 15% Impaired Glucose Tolerances, IGT prevalence (9).

The distribution of DM between male and female patients, as shown in Table 1, shows variations in different studies. Some studies indicated proportional distribution (10-12), where as in others the proportion seems more inclined to either one of the sexes (13-15). These differences, however, might be explained by the availability of study subjects during study these analyses.

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Table 1: Female to male percentage distribution of DM cases on selected studies in Ethiopia

Province	Year of study	Sample size	Female/ Male %	Reference
Addis Ababa and central Ethiopia	1976-1983	849	50.2 %Female; 49.8% Male	[10]
Addis Ababa	1996-1997	283	48.4% Female; 51.6% Male	[11]
Gondar, Northwest Ethiopia	2000-2009	1553	42.5% Female; 57.5 Male	[12]
Addis Ababa	2005 – 2009	724	48.3% Females; 51.7% Male	[13]
Addis Ababa	2005	229	63.8% Female; 36.2% Male	[14]
Jimma, South west of Ethiopia	2008	305	37% Female; 63% Male	[15]

Table 2: Distribution of DM associated complications on selected studies conducted in Ethiopia

Province	Year of study	Sample size	Hypertension %	Retinopathy% (eye disease)	Neuropathy %	Nephropathy (renal disease)	Foot disease%	Reference
Addis Ababa	1976-1983	849	12.1	33.3	27.7	27.7	-	[10]
Addis Ababa	1996-1997	283	18.4	31.4	35.2	23.3	1.7	[11]
Addis Ababa	2005 – 2009	724	34	15.5	12.4	32	-	[13]
Addis Ababa	2005	229	34.1	33.2	10.5	21.0	-	[14]
Jimma	2008	305	24.9	33.8	29.5	15.7	4.6	[15]

Regarding the progress and distribution of DM in Ethiopia, a ten year retrospective study on the spread of DM conducted in Gondar Hospital (Northern Ethiopia) indicated that both Type 1 DM (T1DM) and Type 2 DM (T2DM), cases increased by 125% on average (16). T1DM was mostly diagnosed at late age, for example in Gondar, average 30.4+/- 11.6 years old, which is different from what is known in western countries (17, 18). Moreover, studies indicated that T1DM is more common in rural parts of the county (18), whereas T2DM is more prevalent in urban areas and big cities of the country (15). On the other hand, the prevalence gestational diabetes mellitus (GDM) in Ethiopia, shows big ranges, from 3.7% in Tigray, Northern Ethiopia (19) to 0.4% in Addis Ababa (20). The variation in GDM may be associated with socio economic, availability of health

facilities, study subject selection, and study period differences between two study places. But to see the actual picture of GDM in the country, more studies need to be undertaken.

Diabetes and Associated Complications in Ethiopia:

DM is usually characterized by complications that occur in the natural course of the disease progression. DM associated complications and admissions in Addis Ababa, at St. Paul and Black Lion Specialized Hospitals show that the prevalence has increased from 7.1% in 2005 to 34.1% in 2009 (13). Diabetes keto-acidosis (DKA), one of the acute complications, is most commonly seen on T1DM patients (15, 21), whereas other chronic complications of DM including retinopathy, neuropathy, and foot diseases are mostly seen in T2DM patients.

Table 3: Prevalence of infectious diseases in DM on selected studies conducted in Ethiopia

Study site and year	Sample size	Infectious diseases in DM and prevalence percentage (%)	Ref.no.
Addis Ababa [2009]	413	Urinary tract infections(UTI).....10.9 %	[23]
Gondar [2010]	422	Urinary tract infections(UTI).....17.8%	[24]
Gondar [2010]	422	Candidacies.....8.3 %	[27]
Addis Ababa [1989-1996]	1352	Mycobacterium tuberculosis5.8%	[28]
Jimma [2008]	305	Mycobacterium tuberculosis5.6 %	[15]
Gondar [2011-1012]	199 among Tb.DM	Mycobacterium tuberculosis8.5 %	[26]
Desse [2012]	225 among DM...Tb	Mycobacterium tuberculosis6.2 %	[29]
Jimma [2010]	604	Hepatitis C virus.....9.9 %	[25]
Woldya [2010-2011]	216	Hepatitis B virus.....3.7 %	[30]

As shown in table 2, hypertension increased from 12.1% in 1980s (10) to more than 34 % in 2009 (13, 14); whereas eye disease prevalence just like that of 1980s (10), in 2009 reports indicated prevalence still as high as

above 33% (15). In addition, other DM associated complications including neuropathy and renal diseases prevalence rate in recent years has reached up to 29.5 % and 32% respectively (13, 15).

Impotency, the other major health problem on diabetes patients, was assessed on 292 T1DM and T2DM men at Black Lion Specialized Hospital, and almost 49 % had the problem, whereas similar study in Jimma, indicated that of the studied 305 DM patients, almost 7% had impotency. The problem was more observed on T2DM patients and the compliance of the problem increases with the increase in the duration of DM (15, 22).

The reported difference might be associate with cultural difference to discuss about the issues as well awareness about association of DM and Impotency by the patients in the two study sites.

Diabetes with other Communicable Diseases in Ethiopia:

DM exposes to other communicable diseases or else the reverse is supposed to happen in many researches. Studies conducted in Ethiopia, as shown in table 3, indicated that most commonly observed infectious diseases on Ethiopian DM patients include: Urinary Tract Infection (UTI), Hepatitis C Virus (HCV) infections, *Mycobacterium tuberculosis*, and Candidacies infections. Prevalence of these diseases reaches up to 17.8% (24), 9.9% (25), 8.5% (26), and 8.3% (27) respectively. As indicated by different researches, the occurrence of communicable diseases also increases during progress of DM in Ethiopia.

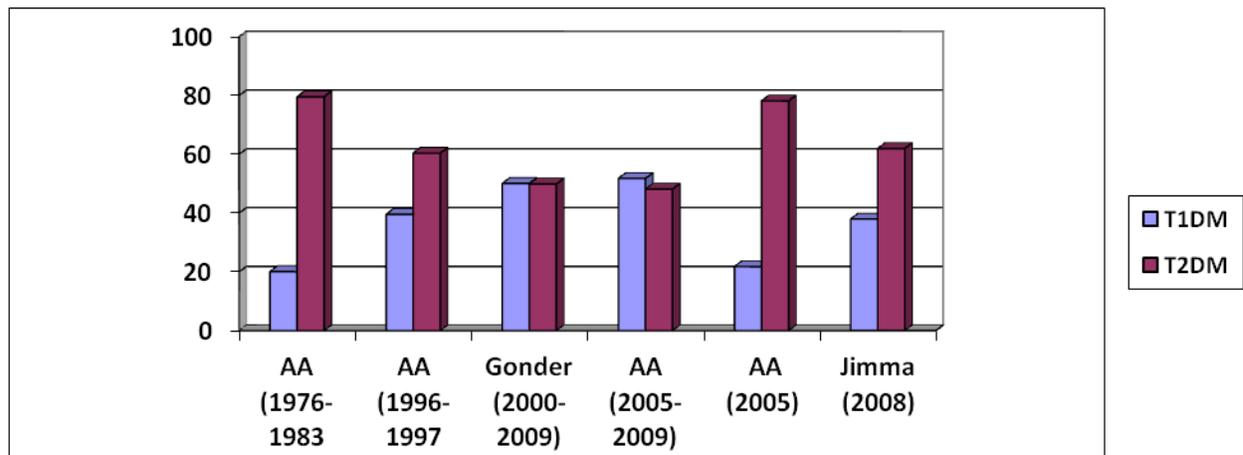


Figure1: Distribution of T1DM and T2DM on selected studies conducted in Ethiopia

Discussion

The actual prevalence of DM in Ethiopia could be as high as 8% (8) as suggested by some institution-based studies, aside from what is projected by IDF in 2012 as 3.32% (7) in 2012. Although strong nationwide surveillances have not been conducted, the DM expansion rate is growing in alarming rate, and so are associated morbidity and mortality rates.

The distribution of T1DM, and T2DM in Ethiopia, shows regional variations, T1DM is more dominant in rural parts, whereas T2DM is more common in small and big cities of the country (8, 15). Moreover, the occurrence of T2DM in the country looks to progress so fast and going to become the leading cause of morbidity and mortality among non-communicable diseases (13, 16). This is largely associated with an increase in the income of the country, and gradual life style shift of the people into "modern" life.

On the other hand, the reported prevalence of GDM greatly varies in the country (range from 3.7 to 0.4%) (19, 20). The reason of which is not clear but indicated, up to the knowledge of the reviewer, scarcity of research on this type of DM, or regional differences in the quality of mother care during study periods. GDM is one of the

serious health problems on pregnant mothers, and if not diagnosed and controlled on time, could result in serious morbidity and mortality on the mother and the fetus.

Diabetes associated complications, including keto-acidosis DKA, hypertension, retinopathy, neuropathy, nephropathy, and DM foot diseases are now-a-days very common in most hospitals and other health institutions in Ethiopia (13). Although there are discrepancies among studies on the prevalence of complications among DM patients, the overall picture shows that DM complications in Ethiopia are rapidly increasing during the last decades. One of the major possible reasons for the expansions of the complications is diagnosis of the DM mostly rely only on blood glucose determinations. If other diagnostic approaches, such as Hemoglobin A1C determinations, Serum insulin, and C-peptide concentration determination would be applied, the complications may be diagnosed at early stages (14, 31) and worsening prevented. In addition poor understanding about the nature of DM by patients, and/or insufficient information by diabetic clinics or nearby health institutions may prevent that patents pursue a serious treatment follow up after diagnosis of DM.

Infectious diseases are important causes of morbidity and mortality among diabetes patients. For example, the prevalence of high blood sugar value, among 199 consecutive active *M. tuberculosis* patients was 8.5% in Gondor, and high DM prevalence was shown especially in those who have TB-HIV/AIDS co-infected patients (26). As other related studies indicate, occurrence of *M. tuberculosis* infection in DM patients, makes treatment outcome for *M. tuberculosis* poor, and results in the development of drug resistant. These will cause serious complications, and even shorten life span of DM patients (32). Therefore, including *M. tuberculosis* diagnosis for DM patients may be important in Ethiopia to prevent and control associated problems at the early stages.

The other communicable diseases such as candidiasis and UTI are usually higher on female DM patients. This is mainly due to anatomical and physiological nature of urinary tract and genital areas difference between male and females (23, 24, 27). Regular checkups of DM patients for bacteriuria, mainly for UTI, are so crucial for treatment and prevention of the development of renal complications. Therefore, in routine DM check-ups, mainly for female patients, diagnosis for UTI and candidiasis infections should be included.

Hepatitis, the other commonly seen infectious disease among DM patients, has got an attention as a risk factor mainly for T2DM in recent years (33, 34). According to a study conducted in Jimma, Ethiopia, there is a positive correlation between DM and HCV (25), where as that of the study done in Woldyia, Northern Ethiopia, could not show the significant association of HBV and HCV with DM (30). These differences may come from either from the methods used by the researchers to diagnose HBV and HCV infections, or by chance of selection of study participants. But, in general, as hepatitis virus mainly affect the liver, the principal organ on the regulation of blood sugar, it is so important to obtain more consistent data on the association of DM and hepatitis by conducting large scale cohort studies. In Addition, it may be important to consider diagnosing of HCV infected patients also for DM.

In general gradual impairment of immune function on DM patients (35) makes them vulnerable to communicable diseases. Therefore, health care workers and other stakeholders need to redouble their efforts to increase the public awareness on DM pathology and advocate the importance of uninterrupted follow-ups at diabetic clinics.

Conclusion

DM is the one of commonest non-communicable disease responsible for a number of serious health problems and complications in Ethiopia. Like many other developing countries, in Ethiopia too, more attention is given to the communicable diseases, such as HIV/AIDS, tuberculosis and malaria. However, studies are indicating that non-communicable diseases, such as DM are becoming major

public health problems in the country. Hence, due attention should be given to DM through increasing public awareness on the diseases and even plan mass screening programs for DM. Moreover, efforts should be exerted to educate DM patients on how to control and reduce occurrences of DM associated complications. They should also be trained in proper diagnostic methods and treatments in order to lead a healthy and productive life.

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References

1. World Health Organization. Definition, diagnosis and classification of diabetes mellitus and its complications. Report of a WHO consultation. Geneva: World Health organization; 1999.
2. Perzanowski MS, Ngàngà JW Carter MC, Odhiambo J, Ngari P, Vaughan JW, Chapman MD, et al. Atopy, asthma, and antibodies to ascariasis among rural and urban children in Kenya. *J Pediatr* 2002;140:582–588.
3. Wild S, Sicree R, Rogel G, King H, Green A. Global prevalence of diabetes. *Diabetes Care* 2004; 27:1047–1053.
4. Gill GV, Mbanya JC, Ramaiya KL, Tesfaye S. A Sub-Saharan African perspective of diabetes. *Diabetologia* 2009; 52:8–16.
5. Motala A, Ramaiya K, (Edit.) Diabetes: the hidden pandemic and its impact on sub-Saharan Africa. Diabetes leadership forum; Africa, 2010.
6. Diabetes estimates and Projections. World Health Organization. diabetes@who.int Accessed on Oct. 2003.
7. IDF Diabetes Atlas. 5th ed. 2012 updates.
8. Sachithanan than V, Loha E, Gose M. Prevalence of diabetes mellitus, hypertension and lipodystrophy in HAART receiving HIV patients in Southern Ethiopia. *Internat STD Rese &Revi*2013;1(1):1-11.
9. Yemane T, Belachew T, Asaminew B, Befekadu O. Type II diabetes mellitus in Jimma Town, South West Ethiopia. *Eth J Health Sci* 2007;17(2).
10. Lester FT. The clinical pattern of diabetes mellitus in Ethiopians. *Diabetes Care* 1984;7(1):6-11.
11. Ejigu A. Pattern of chronic complications of diabetic patients in Menelik II Hospital, Ethiopia. *Ethiop J Health Dev* 2000;14(1):113-116.
12. Abebe SM, Berhane Y, Worku A, Alemu S. Increasing Trends of Diabetes Mellitus and Body Weight: A Ten year Observation at Gonder University Teaching Referral Hospital, North West Ethiopia. *PLoS ONE*. @013; 8 (3):e60081
13. Adem A, Demis T, Feleke Y. Trend of diabetic admissions in Tikur Anbessa and St. Paul University Teaching Hospitals from January 2005-December

- 2009, Addis Ababa, Ethiopia. *Ethiop Med J* 2011;49(3):231-8.
14. Feleke Y, Enquselassie F. Assessment of health care for diabetes in Addis Ababa, Ethiopia. *Ethiop J Health Dev* 2005;19(3):203-210.
 15. Worku D, Hamza L, Woldemichael K. Pattern of diabetic complications at Jimma University Specialized Hospital, Southwest Ethiopia. *Ethiop J Health Sci* 2010;20 (1):33-39.
 16. Mekonnen SM, Berhane Y, Worku A, Alemu S. Increasing Trends of Diabetes Mellitus And Body Weight: A Ten Year Observation at GondarUniversityTeachingReferralHospital, Northwest Ethiopia. 2013. PLoS ONE 8(3):
 17. Ayesha A, Motala Mahomed A, Omar K, Fraser JP. Epidemiology of type 1 and type 2 diabetes in Africa. *J Cardiovas Risk* 2003;10:77-83.
 18. Brown V, Alemu S, Watkins P. Diabetes in Ethiopia: overcoming the problems of care delivery. *J DiabeNurs* 1998; 2 (1):28-30.
 19. Seyoum B, Kiros K, Haileselase T, Leole A. et al: Prevalence of gestational diabetes mellitus in rural pregnant mothers in northern Ethiopia. *Diabetes Res ClinPract* 1999; 46(30):247-51.
 20. Admassu G, Gaym A. Outcome of pregnancy complicated by diabetes at TikurAnbessa Hospital, Addis Ababa, Ethiopia-A five year review. *Eth J Repr. Helath.*2009;3 (3):34-43
 21. Newton C, Raskin P. DKA in type I and type II DM, clinical and biochemical differences. *Arch Intern Med* 2004; 164: 1925-31.
 22. Seyoum B. Impotence in Ethiopian diabetic men. *East Afr Med J* 1998;75(4):208-10.
 23. Yeshitela B, Gebre-Selassie S, Feleke Y. Asymptomatic bacteriuria and symptomatic urinary tract infections (UTI) in patients with diabetes mellitus in Tikur Anbessa Specialized University Hospital, Addis Ababa, Ethiopia. *Ethiop Med J* 2012;50(3):239-49.
 24. Yismaw G, Asrat D, Woldeamanuel Y, Unakal C. G. Urinary Tract Infection: Bacterial etiologies, drug resistance profile and associated risk factors in diabetic patients attending Gondar University Hospital, Gondar, Ethiopia. *Euro J Exp Bio* 2012;2 (4):889-898.
 25. Ali S, Abera S, Mihret A, Abebe T. Association of Hepatitis C virus infection with type II diabetes in Ethiopia: A hospital-based case-control study. *Interdis Perspec Infe Dise* 2012;1-7.
 26. Getachew A, Mekonnen S, Alemu S, Yusuf H. High magnitude of diabetes mellitus among active pulmonary tuberculosis patients in Ethiopia. *Bri J f Med& Medic Res* 2014;4(3):862-872.
 27. Yismaw G, Asrat D, Eoldeamaueel Y, Unakal C. Prevalence of candiduria in diabetic patients attending Gondar University Hospital, Gondar, Ethiopia. *IJKD* 2013;7:102-7.
 28. Feleke Y, Abdulkadir J, Aderaye G. Prevalence and clinical features of tuberculosis in Ethiopian diabetic patients. *East Afr Med J* 1999;76(7):361-4.
 29. Amare H, Gelaw A, Anagaw B, Gelaw B. Smear positive pulmonary tuberculosis among diabetic patients at the Dessie Referral Hospital, Northeast Ethiopia. *InfeDisePove* 2013;2(6):1-8.
 30. Mekonnen D. Prevalence of hepatites B virus in patients with diabetes mellitus: A comparative cross sectional study at Woldiya GeneralHospital. [MPH Thesis]: Addis AbabaUniversity, 2011.
 31. Siraj E.S, Reddy S. K, Scherbaum W.A et al. Basal and Postglucagon C-Peptide Levels in Ethiopians with Diabetes [cited 2013]; Available at; URL:<http://care.diabetesjournals.org/content/25/3/453.full>.
 32. Baker MA, Harries AD, Jeon CY, et al. The impact of diabetes on tuberculosis Treatment outcomes: A systematic review. *BMC Medicine* 2011;9(81):3-15.
 33. Lecube A, Hern´andez CJ, Genesc’a R, Sim´ O. Glucose abnormalities in patients with hepatitis C virus infection: epidemiology and pathogenesis. *Diabetes Care* 2006; 29(5):1140–1149.
 34. Negro F, Alaei M, “Hepatitis C virus and type 2 diabetes. *Wor J Gastroenter* 2009;15(130):1537–1547.
 35. Shah B R., Hux J E. Quantifying the risk of Infectious disease for People with Diabetes. *Diab. Vare.* 2003;26(2):510-513.