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Is Periodontitis the Missing Link? A Metaethnographic Review of Glycemic Control Measures by Nigerian Diabetologists

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Abstract

Diabetologists have always been aware of the adverse infect of infection on glycemic control. Periodontitis is a state of chronic subclinical inflammation exerting a similar adverse influence on glycemic control.

The mortality of diabetes mellitus in Nigeria remains high despite attempts at "tight glycemic control" using diet, life style modification, oral hypoglycemic and insulin. Reported attainment of glycemic control is at times as low as 15%. The result of the failure in meeting glycemic control targets has taken in toll on the life of Nigerians and stretched our meager resources to the limits due to frequent admissions as a result hyperglycemic emergencies. These emergencies leave in their trail, reduced sexual function, microangiopathy and attendant end stage renal disease, blindness, limb amputations and death,

Could lack of consideration for periodontitis be the missing link in the glycemic control protocols of Nigerian diabetologists?

Using the search phrase Nigeria AND (diabetes OR diabetic OR diabetics), we conducted a search of existing literature in Cochrane Library, MEDLINE (PubMed), Mesh (MEDICAL SUBJECT HEADINGS (MeSH) databases. An initial number of 709 results were trimmed to 31 after application of inclusion criteria. We conducted a combination of metaethnography and narrative synthesis on the 31 studies and arrived at the hypotheses that the average Nigerian diabetologists appears UNAWARE of the link between glycemic control and periodontitis. Urgent training is recommended for Nigerian diabetologists through continuing education courses and collaboration with periodontologists.

Keywords: Diabetes mellitus; Nigeria; Periodontitis; Glycemic control

Key messages: The mortality of diabetes mellitus remains high in Nigeria. Despite advances in the multidisciplinary management of diabetes mellitus, Nigerian doctors appear largely unaware of this silent cause of poor glycemic control. Could this hold the key to significant success of poor glycemic control among Nigerian diabetics?

Background

Periodontitis is a state of chronic inflammation resulting in increased levels of proinflammatory mediators which increases insulin resistance resulting in poor glycemic control [1]. Periodontitis increases the risk of developing diabetes-associated complications by promoting the occurrence, progression and severity of diabetes [2]. Based on these findings, a team of German researchers have recommended that periodontal treatment should be part of the diabetes management protocol [2].

Unfortunately, Nigerian diabetologists appear to be completely unaware of this missing link in difficult glycemic control with dire consequences. Diabetic foot gangrene accounted for 55% of amputations at the Lagos University Teaching Hospital [3]. Poor glycemic control and consequent diabetic hyperglycemic emergencies accounted for the highest number diabetes-related admissions at the University of Ilorin Teaching Hospital [4] and diabetes mellitus accounted for 18% of end-stage renal disease among Nigerians [5,6].

These sober statistics informed our decision to undertake this qualitative review as a preliminary step towards highlighting this costly omission by Nigerian diabetologists.

Review Question

The prevalence of diabetic hyperglycemic emergencies and attendant admissions and mortality [4] got us thinking of a missing link already explored in literature but virtually unknown among Nigerian diabetologists. We were concerned about the level of awareness of the link between chronic periodontitis and poor glycemic control among Nigerian diabetologists. We decided on this review to answer the following questions;

1. Is periodontal examination part of the current diabetes management protocol in Nigeria?
2. Do Nigerian diabetologists rule out chronic periodontitis in the management of poor glycemic control?

Being a qualitative review precluded the use of metaanalysis which is restricted to statistical of numerical outcomes of controlled clinical trials. We therefore settled for metasynthesis using the approach of a metaethnography of all available studies that met our inclusion criteria. Because of the ambiguities and lack of clear consensus on many aspects of a metaethnography, however, we decided to combine this review approach with a narrative synthesis as detailed in Table 1.

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Deciding What is Relevant to the Initial Interest

Defining the focus of the synthesis

A search on diabetes AND Nigeria yields thousands of unmanageable studies and distracts from our focus-- consideration of an important factor in glycemic control-- periodontitis. We realized that conducting a search on the attitudes of Nigerian diabetologists would also yield too few studies. To strike a balance therefore, we decided to focus on studies on the actions of diabetologists i.e., what they considered important while managing cases of difficult glycemic control or factors they considered important while instituting the so-called "tight glycemic control." This way, we attempted to read the "clinical mindset" of Nigerian diabetologists by investigating what clinical parameters they considered important while attempting to maintain "tight glycemic control." This decision yielded the dividends of more specific and better manageability of studies which helped us to quickly answer our review question.

Locating relevant studies

Locating relevant studies as an important part of deciding what is relevant to the initial interest. We searched Cochrane Library, MEDLINE (PubMed), Mesh (MEDICAL SUBJECT HEADINGS (MeSH) using the search phrase Nigeria AND (diabetes OR diabetic OR diabetics) (Table 2a).

Inclusion decisions/ criteria

we applied the limits set to "human," and "English" to the original 709 Pubmed hits to the search phrase Nigeria AND (diabetes OR diabetic OR diabetics). This streamlined the studies to 549. Adding the 32 hits from AJOL (African Journal Online) and Cochrane databases resulted in a total 590 studies. Further filtering of studies was performed using the term "glycemic control" and "control" resulting in 76 qualifying studies. To be included, a study had to be either an interventional study on glycemic control or one recommending interventions for tight glycemic control.

On these premises, 2 studies were excluded because they were written by dentists which were not diabetologists and 4 other studies were excluded because they were reviews not limited to Nigeria. The 2 case reports in our results were excluded due to the low evidence associated with such studies while 37 separate studies were excluded because were observational studies.

Aim	To determine consideration of periodontitis among Nigerian diabetologists.
Search Strategy	Search phrase used: Nigeria AND (diabetes OR diabetic OR diabetics) yielding 750 studies
Quality assessment:	7 Criteria used (Adapted to fit our research question)
Synthesis Approach:	Metaethnography combined with a bit of Narrative Synthesis
Key findings:	Diabetes mortality and morbidity still high in Nigeria, Glycemic control poor in most patients. Nigerian diabetologists appear to be unaware of link between poor glycemic control and periodontitis.
Hypotheses resulting from synthesis	Most Nigerian studies on diabetes have centered on microangiopathy, mortality and determinants of glycemic control. None of the studies by Nigerian diabetologists have mentioned, considered or advocated periodontal evaluation as part of glycemic control protocol for Nigerian diabetics. Nigerian diabetologists appear unaware of the link between periodontitis and poor glycemic control. Current unacceptable mortality and morbidity of diabetes in Nigeria might be connected with this great omission. While the non-consideration of periodontitis appears to be the missing link for unexplained poor glycemic control among Nigerian diabetics, further studies in the form of surveying Nigerian diabetologists or interviews are needed to fully establish this missing link.

Table 1: What we did: The process of using metaethnography and narrative synthesis to arrive propose a hypothesis. Hypothesis "Nigerian diabetologists appear unaware of the link between periodontitis and poor glycemic control."

Database	Hits	Search Period
Cochrane Library	9	All time
PubMed (Including Medline)	709	All time
Mesh (MEDICAL SUBJECT HEADINGS (MeSH)	0	All time
AJOL	32	All time

Table 2a: Search results using the search phrase: Nigeria AND (diabetes OR diabetic OR diabetics). A total of 750 initial hits resulted from a search of the stated databases.

Inclusion Criteria	**Exclusion criteria**
Nigerian Study	Studies by other experts aside diabetologists
Reported in English language	Papers not limited to Nigeria
Human subjects	Case reports
Glycemic control" / "control" of diabetes	Reviews
Study carried out by diabetologists	Observational studies
Interventional studies	

Table 2b: Inclusion & Exclusion Criteria. 6 inclusion and 5 inclusion criteria were applied to the initial pool of 750 studies which resulted in the final list of 31 included studies.

Based on the above, a total of 31 qualifying studies which met our criteria were included in the review. No other rigorous exclusion criteria were included. (Table2b, Figure 1)

Quality assessment

There's much confusion in literature and lack of consensus on whether quality assessment of publications should form an integral part of a metaethnography or not. We adopted and modified the list of criteria used by [7] to make the criteria relevant to our research question. Our results were expressed in percentages to give readers a clearer picture of the scenario.

Application of the modified quality criteria revealed that most of the Nigerian studies were strong on methodology, evidence-based conclusions and statement of study objectives. However, most studies were weak on adequate description and appropriateness of sampling methods. There was a rough balance among studies on adequate description of statistical tools and adequate description of study settings. However, based on the limitation that most study (26 of 31) assessments were based on abstracts, we followed the example of [7] and decided not to exclude any study on the basis of quality assessment scores alone (Table 3).

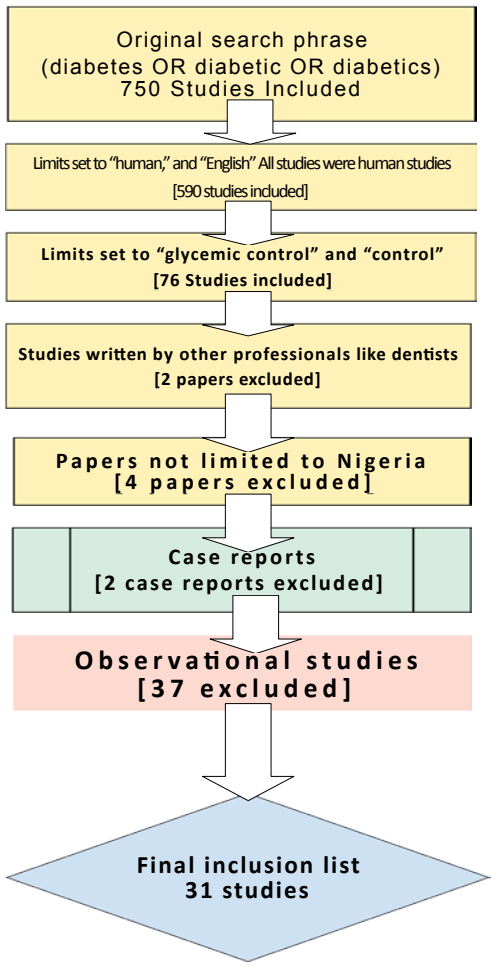

Figure 1: Inclusion and Exclusion Flow Chart. The selection process: 750 initial hits were trimmed down to 31 studies through a set of inclusion and exclusion criteria as stated above.

QA Criterion	QA Criterion Met (%)	QA Criterion Not Met (%)
Study Aim/Objective Stated	20 (64.5)	11 (35.5)
Study Methodology Justified	25 (80.6)	6 (19.4)
Study Context Described	16 (51.8)	15 (48.2)
Sampling Method Appropriate	13 (41.9)	18 (58.1)
Statistical Analysis Appropriate	12 (58.7)	19 (61.3)
Conclusions Supported by Evidence	21 (67.7)	10 (32.3)
Periodontitis Mentioned/Considered	0	0

Table 3: Quality Assessment Criteria and Scores. Results of quality assessment of publications based on 7 criteria. No paper was excluded based on quality assessment results. None of the publications mentioned or considered periodontitis.

Reading the Studies and Determining Order of Constructs

As interpreted by Atkins and coworkers [7], this step should involve reading studies and determining the order of constructs. However, we found that most of our studies couldn't be categorized into these constructs without undue monotony. This conclusion emanates from the fact that virtually all the conclusions would fit into authors' interpretations of observations or results of interventions. This would make all our constructs 2nd order constructs which would result in undue monotony. We therefore decided to skip this step in our review.

Determining How the Studies are Related and Translating Studies into One Another

Since these two steps appear close in our interpretation, we decided to combine the two steps resulting in two tables. We decided to introduce colour-matching of the tables in order to make for easy reason and comparison of our initial synthesis with our reciprocal translations. Given the methods used by Atkins and coworkers [7], we arranged our studies into a chronological order for the purpose of comparison to translate one study into another, we decide to make use grouping and tabulation -- tools recommended in developing a narrative synthesis as recommended by After this, we adopted the principle of reciprocal translation as explained by Atkins and coworkers [7] and recommended as a technique for exploring relationships by Jennie Popay and colleagues [8]. We adopted this approach for two main reasons. First, there's much confusion on the actual process of metaethnography and secondly, to avoid the easy trap of losing sacrificing the rich details of previous individual studies on the altar of some "higher interpretation" of the findings of previous studies. (Table 4&5)

Synthesizing Translations

The process for synthesizing translations is quite unclear as observed by [7]. For the purpose of our review, we decided that the narrative translation tool of tabulation combined with a modified form of reciprocal translation expressed in step 5 covered the requirements of the current step (6).

Expressing the Synthesis

From the foregoing so far, we can confidently express the argument/hypotheses that

1. Most Nigerian studies on diabetes have centered on microangiopathy, mortality and determinants of glycemic control.

Author/s [Ref. No]	Main Outcome Measure	N	Special Subject Features	Conclusions	Glycemic Control Attempted/ Advocated	Main Recommendation
Oli [9]	Remissions	43	Required insulin for initial control	Remissions remain unexplained	Attempted	None
Onyeme et al. [10]	HbA1 usefulness	?	Various: DM, Anemia, HBSS	HbAS has reducing effect on the %HbA1	Attempted	Further investigation necessary
Oli and Ikeakor [11]	High carbohydrate effect	160	Non-obese NIDDM	No effect on glycemic control	Attempted	Carbohydrate maybe beneficial
Erasmus et al. 12]	Diabetic retinopathy	377	Mature cataract patients excluded	Diabetic retinopathy on the increase	Advocated	Stress preventive measures
Akanji et al. [13]	Microangiopathy	50	Diabetic patients	Hypertension and infection critical	Attempted	Encourage early presentation
Akanji et al. [14]	Keiroarthropathy	256	Ambulant diabetic patients	Racial factors affect Keiroarthropathy	Attempted	None
Famuyiwa et al. [15]	Glycohaemoglobin levels	54	Healthy pregnant Nigerian women	Cord blood and maternal GHb related	Advocated	Optimizing glycemic control
Bella [16]	IDDM Demographics	57	IDDM	75% of subjects were poorly controlled	Advocated	Diabetic relief measures needed
Akanji et al. [17]	Plasma TAG clearance	32	NIDDM and healthy controls	Postprandial lipaemia is multifactorial	Attempted	None
Akanji et al. [18]	LCAT activity determinants	19	Obese and non-obese NIDDM	Glycaemia and BMI affect LCAT activity	Attempted	Drug and dietary intervention
Agboola-Abu et al. [19]	Dyslipidaemia	36	NIDDM	Glycemic control improves Outcome	Attempted	Improve glycemic control
Kolawole and Ajayi [20]	Mortality prognosis indices	51	Hypertensive-diabetic, NIDDM	Prognosis in 1999 diabetics , still dismal	Advocated	Early, intensive glycemic control
Agboola-Abu et al. [21]	Dyslipidaemia	35	NIDDM	Oral hypoglycemics didn't affect outcome	Attempted	None
Imam et al. [22]	Autonomic neuropathy	100	Diabetic patients	Poor control confused with neuropathy	Advocated	Perform autonomic function tests
Ogunlade et al. [23]	Limb amputation patterns	101	Amputees	Glycemic control reduces amputations	Advocated	Improve glycemic control
Nwosu [24]	Diabetic retinopathy	N/A	Nigerian review article	Diabetic retinopathy increasing in Nigeria	Advocated	Urgent DM care guidelines needed
Rotimi et al. [25]	Retinopathy and cataract incidence	840	Nigerian and Ghana Diabetics	Low outcome prevalence in 1st 5 Years	Advocated	Eye exam at first hyperglycaemia
Puepet et al. [26]	Biochemical profiles in DM	75	Diabetic patients	Abnormalities common in Type 2 DM	Advocated	Preventive glycemic control
Kidmas et al. [27]	Indications, morbidity, mortality	87	Amputees	Early presentation and appropriate	Advocated	Community health education
Abioye-Kuteyi et al. [28]	Diet and glycemic control	33	Truncal obesity	Dietary advice affects outcome measure	Advocated	Physicians need dietary mgt skills
Ibanga et al. [29]	Control and corpuscular fragility	108	Diabetics /non-diabetic controls	Hyperglycaemia affects RBC membrane fragility	Advocated	None
Kolawole et al. [30]	Management goal attainment	133	Diabetes health care providers	Very few patients attained targets	Advocated	Periodic effectiveness evaluation
Gadzama et al. [31]	Biochemistry laboratory requests	218	Diabetic patients	Proper utilisation of laboratory tests	Advocated	Team work approach
Adetunji et al. [32]	Microalbuminuria	50	Non-proteinuric diabetics	50% had suboptimal glycemic control	Advocated	None
Akinosun and Bolajoko [33]	Total antioxidant status	40	Type 2 diabetics / healthy controls	Glycemic control reduces outcome measure	Attempted	Control reduces free radicals
Gadzama et al. [34]	Diagnostic laboratory role	N/A	Nigerian review article	Modern laboratories important in management	Advocated	Create required awareness
Odusan et al. [35]	Cardiac autonomic neuropathy	108	Type 2 diabetic patients	Outcome is common among type 2 diabetics	Attempted	None
Yusuff et al. [36]	Patient compliance/adherence	400	Diabetic patients	Glycemic control in 33% of patients	Attempted	None
Ajayi and Ajayi [37]	Diabetic admission outcomes	118	Diabetic admissions	DM accounted for 4.4% of all admissions	Advocated	Establish DM specialist clinics
Ikem et al. [38]	Limited joint mobility	139	Type 2 diabetics / healthy controls	Subjects have moderately severe outcome and Poor glycemic control in 85%	Advocated	None
Chijioke et al. [4]	DM mortality patterns	785	Case notes of type 2 diabetics	Type 2 DM is a common cause of morbidity and mortality in Nigeria	Advocated	Early diagnosis and proper management

Table 4: An analysis of how the studies are related and translating studies into one another based on Main Outcome Measure, Sample Size, Special Subject Features, Conclusions, Whether or Glycemic Control Attempted/Advocated, Main Recommendation of Study.

Outcome Measure	Number of Studies (%)	Main Argument/Thrust of Findings (Modified Reciprocal Translation)	Main Argument/Thrust of Recommendations (Modified Reciprocal Translation)	Comments
Demographic and others	5 (16.1)	Remission remains unexplained in cases. Huge percentage poorly controlled	Varied	"Unexplained " cases makes case for periodontal evaluation
Microangiopathy (Retinopathy & Neuropathy)	8 (25.8)	Microangiopathy is progressive, common among Nigerian diabetics and often a reflection of poor glycemic control	Early diagnosis, Early Eye examination, preventive management through proper glycemic control, performs autonomic function tests and Urgent need to establish standardized care guidelines	Standardized care guidelines should include periodontal examination
Mortality and Morbidity	5 (16.1)	Morbidity and mortality of DM still high in Nigeria	Early diagnosis, early intensive glycemic control and community health education, DM specialist clinic	"Intensive glycemic control" will fail in patients suffering from periodntitis. Therefore, adequate periodontal evaluation and management is necessary. DM specialist clinics should be multidisciplinary
Lipidaemia	4 (12.9)	Proprandial lipidaemia is multifactorial. Improved by optimal glycemic control	Improve glycemic control	Adequate periodontal evaluation and management will help improve glycemic control
Glycemic control determinants and effects	5 (16.1)	Role of diet, controversial. Optimal glycemic control achieved only in a small proportion of patients	Need for improvement and effectiveness of glycemic control measures. Oral hypoglycemics largely failed. Need for dietary management skills and continuous evaluation of effectiveness	Urgent need to increase the awareness of Nigerian diabetologists about how periodontitis affects glycemic control through a "train the trainers" scheme
Biochemical profiles and indicators	4 (12.9)	Biochemical tests under-utilized and at times unavailable	Need for modern laboratory facilities	Advanced rapid tests for periodntitis should be incorporated

Table 5: Groupings and Reciprocal Translation based on
Outcome Measure, Number of Studies, Main Argument/Thrust of Findings, (Modified Reciprocal Translation), Main Argument/Thrust of Recommendations (Modified Reciprocal Translation), Plus Our Comments/Recommendations

Definition of abbreviations:
N = Sample Size HBAS = Sickle; cell trait (Heterozygous); DM = Diabetes Mellitus; Hb = Hemoglobin; HBSS = Sickle Cell Disease (Homozygous); HbA1 = Glycosylated Hemoglobin NIDDM = Non-Insulin Dependent Diabetes Mellitus; GHb = Glycohaemoglobin; IDDM = Insulin Dependent; Diabetes Mellitus TAG= Triacylglycerols LCAT= lecithin: Cholesterol AcylTransferase

2. None of the studies by Nigerian diabetologists have mentioned, considered or advocated periodontal evaluation as part of glycemic control protocol for Nigerian diabetics.
3. Nigerian diabetologists appear unaware of the link between periodontitis and poor glycemic control.
4. Current unacceptable mortality and morbidity of diabetes in Nigeria might be connected with this great omission.
5. Periodontitis is the missing link for unexplained poor glycemic control among Nigerian diabetics.

As in other parts of the world, there are no such experts that we are aware of who are specifically in charge of diabetes and periodontal disease as a combined discipline. Nigeria is however endowed with many expert diabetologists who treat diabetes on one hand and extremely few periodontologists who treat periodontal disease. The focus of our paper is to encourage collaboration between these two groups of experts for the ultimate benefit of the Nigerian diabetic patient.

Conclusion

The message of this metaethnography combined with a bit of narrative synthesis is clear: The morbidity and mortality of type 2 diabetes mellitus in Nigeria remains unacceptably high. The 1978 observations of Oli [9] expressing concerns about "unexplained remissions," and more recent literature pointing to the associations between periodontitis and poor glycemic control - [1,2]. Han et al. [39] have shown that periodontitis predisposes to metabolic syndrome and diabetes while Lakschevitz et al. [40] presented evidence of the establishment of the adverse effect of periodontitis.

In a recent study, Colombo and coworkers demonstrated that Periodontal Disease Decreases Insulin Sensitivity and Insulin Signaling [41]. These are just the most recent among hundreds of studies. The evidence is overwhelming.

We have attempted to paint the obvious picture -- the average Nigerian diabetologist appears UNAWARE of the effects of periodontitis on metabolic control in diabetes mellitus.

One case report is of special interest and was included in the discussion section because the authors had dismissed the association between diabetes and periodontitis based on a single case report and what they termed "personal observations." [42]

So, is periodontitis the missing link in glycemic control attempts by Nigerian diabetologists? Only further studies in the form of surveys/ interviews of Nigerian diabetologists can answer this question in the affirmative.

Recommendations

We recommend the following;

1. Further studies in the form of surveys and /or interviews of Nigerian diabetologists to establish current knowledge and practice of this group of experts as it relates to ruling out periodontitis in glycemic control.
2. We recommendation (1) above confirm my fears, we recommend urgent steps to increase the awareness of the Nigerian diabetologists about the adverse effects of periodontitis on metabolic control.
3. The medical curriculum should include more modules in

dentistry and urgent, sustained collaborative conferences and continuing education courses should be organized between Nigerian diabetologists and periodontologists.

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