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 effect 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, lifestyle 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 a 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 metaanalysis 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. (Table 2b, 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).

### 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.

| 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 (41.3)                |
| Conclusions Supported by Evidence         | 21 (67.7)            | 10 (32.3)                |
| Periodontitis Mentioned/Considered        | 0                    | 0                        |

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 |
| Onyene et al. [10]| HbA1 usefulness      | ? | Various: DM, Anemia, HBS | HbA1S 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]| Keioarthropathy       | 256 | Ambulant diabetic patients | Racial factors affect Keioarthropathy | 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 lisaemia 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 |
| Aboye-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.
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 remain 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 Lakshevitz 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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