
Dakota Diabetes Coalition is proud to offer this column on diabetes and related concerns every other Friday.



Dr. Johnson is a family practice doctor in Grand Forks with a special interest in diabetes -- and a special knack for writing. As a member of the Dakota Diabetes Coalition, he has generously made himself available to answer questions through our listserv. If you have comments, or questions for Dr. Johnson to address in future columns, please contact gailhand@q.com



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Not all A1Cs are the same

Explaining that can help patients improve their management

The A1C test, one of the cornerstone laboratory assessments for diabetes management, roughly represents a 3-month average of daily blood glucose values. A1C values are strongly correlated with diabetes complications, particularly microvascular complications, which include eye disease (retinopathy), kidney disease (nephropathy) and nerve disease (neuropathy).

A1C	eAG
%	mg/dL
6	126
6.5	140
7	154
7.5	169
8	183
8.5	197
9	212
9.5	226
10	240

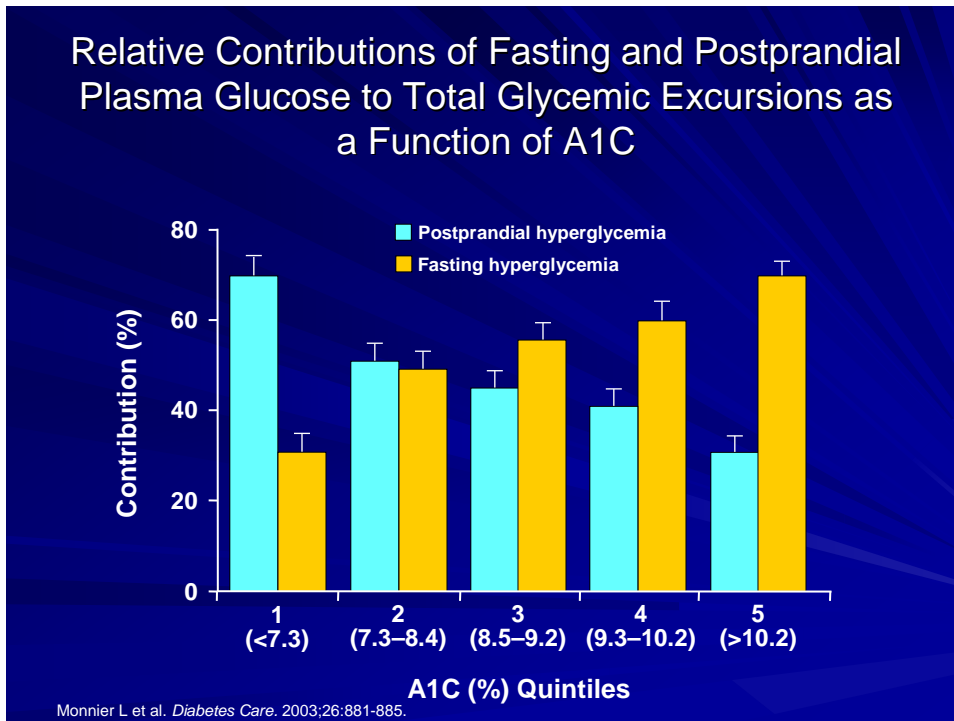
In 2009, the American Diabetes Association published data showing the relationship of A1C to average daily glucose based on 24-hour continuous glucose monitor readings. Patients may be confused when their daily blood glucose values, maybe done only once or twice daily, don't "match up" with their A1C. It's key to explain that A1C represents blood sugar across the entire 24-hour spectrum. Continuous glucose monitoring is like a "movie" of blood glucose values; fingerstick is more like a "snapshot." The more data collected, the more likely that average daily glucose will "match up" with A1C.

One flaw of A1C is that it does not account well for glucose variability. As A1C is an average value, persons with differing ranges of blood glucose values may still have the same A1C. For example, if a person has values ranging from 40 to 400, and another person has values ranging from 70-200, if they have the same daily average glucose, they will have the same A1C. In these examples, it's possible that both could have averages of ~170, and have A1C's of ~7.5.

It is well established that A1C closely correlates with the development of microvascular complications, and not as well with macrovascular (heart disease, stroke) complications. Glucose variability may be more closely correlated with macrovascular disease, as we've discussed in previous columns. Data from continuous glucose monitoring usually give the range of blood glucose values -- in addition to trends and

averages -- and can be an effective way to sort out glucose variability in an individual patient, and may complement A1C.

Another clinical issue with A1C is its overall composition: How much of an individual A1C is from fasting blood glucose levels and how much is from post-meal values? The answer is, it depends, as illustrated in the following graph:



In this study, Monnier and associates demonstrated that the lower the A1C, the more that post-prandial (post-meal) blood glucose values contribute to that A1C. Lower A1C's (< ~7.5) need more focus on post-prandial blood glucose values, while higher A1C's need more focus on fasting blood glucose values. Typically, in practice, this bears out that most patients with type 2 diabetes will need mealtime rapid acting insulin in addition to long-acting basal insulin. When trying to achieve an A1C of <7%, these trends likely apply to type 1 patients as well.

A1C, for all of its value in clinical diabetes practice, has some limitations. When patients understand those limits and what additional information they need to get a broader view of blood sugar values, it becomes easier for them to link their behavior to their blood sugar levels. Making strong blood glucose management techniques a habit

will result in more consistent blood glucose values. And that means better health -- and less frustration -- for patients with diabetes.

Eric L. Johnson, M.D., is a member of the Dakota Diabetes Coalition. He serves as Assistant Medical Director at Altru Diabetes Center and is an Assistant Clinical Professor in the Department of Family and Community Medicine at the University of North Dakota School of Medicine and Health Sciences.

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[Explain A1C for Better Management, Dr. Johnson's Column #46, May 29, 2009](#)