Using a Blood Test to Prevent Mortality in Undiagnosed Type 1 Diabetics

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We know that people of all ages, races, and genders can develop Type 1 Diabetes and Diabetic Ketoacidosis. DKA is the leading cause of death in diabetics under the age of 24. We also know that blood glucose levels (and consequently, A1C levels) can be elevated before a person recognizes or even experiences symptoms. For example, a normal blood glucose for a healthy person is 70-110 mg/dL. However, if a person is used to having a blood glucose level of 250 mg/dL, they would not feel symptoms of a high blood sugar. This person may not experience symptoms (needing to urinate more often, being more thirsty than usual) until their blood glucose levels are 300-400 mg/dL or higher. This puts them at great danger of developing DKA.

<table>
<thead>
<tr>
<th>A1C (%)</th>
<th>A1C (mmol/mol)</th>
<th>Est bg (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
<td>31.5</td>
<td>68.0</td>
</tr>
<tr>
<td>5.5</td>
<td>36.2</td>
<td>111.5</td>
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<tr>
<td>6.0</td>
<td>42.0</td>
<td>125.0</td>
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<tr>
<td>6.5</td>
<td>47.5</td>
<td>139.8</td>
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<td>7</td>
<td>53.0</td>
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<td>7.5</td>
<td>58.4</td>
<td>168.5</td>
</tr>
<tr>
<td>8</td>
<td>63.9</td>
<td>182.9</td>
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<tr>
<td>8.5</td>
<td>69.4</td>
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<tr>
<td>9</td>
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<td>9.5</td>
<td>80.3</td>
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</tr>
<tr>
<td>10</td>
<td>85.8</td>
<td>240.3</td>
</tr>
</tbody>
</table>

Table 1 (above). Conversion of A1C as a percentage to mmol/mol. Conversion of HbA1C values from % to mmol/mol (soc-bdr.org)

Table 2 (above). If you look at Figure 2, you will see that when diagnosed with Type 1 Diabetes, patients typically have an A1C much higher than is recommended. This figure also shows that those with DKA have a much higher A1C and estimated blood glucose at time of diagnosis. Conversion of HbA1C values from % to mmol/mol (soc-bdr.org)

Fig. 1. Signs and Symptoms of DKA. Diabetic Ketoacidosis (DKA) is a life-threatening complication of Type 1 Diabetes that causes over 100,000 hospitalizations each year in the United States. DKA is killing people without warning across the globe. Approximately 30% of people who die of Diabetic Ketoacidosis do not have a known history of diabetes.

Fig. 2. A breakdown of DKA prevalence in the United States by biological sex, race, age, and insurance. This shows us that DKA does discriminate. A person of any age, race, or gender can have diabetes and may be a victim of DKA. An Update on the Incidence and Burden of Diabetic Ketoacidosis in the U.S. Diabetes Care (diabetesjournals.org)

Fig. 3. A1C results are typically the highest at the point of diagnosis of type 1 diabetes. This makes people more at risk for developing DKA at or before diagnosis of diabetes. BDPF1 | Free Full Text | Diabetic Ketoacidosis Severity at Diagnosis and Glycemic Control in the First Year of Childhood Onset Type 1 Diabetes—A Longitudinal Cohort Study | mpdf.com

What’s the big deal?
More and more people developing DKA do not know that they have diabetes.

If you don’t know you have diabetes, you cannot treat it. Therefore, you cannot prevent a complication such as DKA.

People are losing their lives without being given a fighting chance.

**Costs associated with DKA & A1C Tests:**
- National bill for DKA in 2017 — $6.8 billion
- DKA represents more than $1 of every $4 spent on direct medical care for patients with Type 1 Diabetes
- DKA represents approximately $1 of every $2 on medical care for patients experiencing multiple occurrences of DKA
- Cost of hospitalization with DKA in 2017 — $30,836.19
- Cost of A1C Test — $19.10

**Recommendation**
It is already recommended that school-aged children have a well child visit with their health care provider once a year.

At these visits, I would recommend that school-aged children get an A1C test to determine their risk for developing Type 1 Diabetes and/or Diabetic Ketoacidosis.

A1C tests can be done by a finger stick or blood draw. If a child is already due for blood work during their annual physical, they would be able to get this test done at the same time without an additional fingerstick or the need to give additional blood.

If the A1C comes back 6.5% or higher, additional testing would be needed to determine if a child has diabetes or DKA. If a child is not symptomatic or mildly symptomatic, a repeat A1C should be tested in 3 months. If a child is moderately symptomatic, a random glucose test should be done. If the blood sugar is 200 mg/dL or higher, a fasting blood glucose should be checked the next morning. If the fasting glucose is higher than 126 mg/dL, a diagnosis of diabetes is appropriate. If a child is severely symptomatic, they may need to be hospitalized for blood glucose testing and to determine if they are in DKA.

**References**

**Acknowledgements**
I would like to say thank you to Dr. Bowman for encouraging me to pursue this topic that I am so passionate about. Thank you for offering this opportunity to continue learning and sharing my heart with others regarding Type 1 Diabetes and DKA prevention. I would also like to thank my family, friends, and boyfriend Devin for helping me manage my Type 1 Diabetes so well. I could not do this without you.