

Results from the YourSAY: Glucose Monitoring study

Frequency of and reasons for self-monitoring of blood glucose among Australians with insulin-treated diabetes

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Background

- More than 350,000 Australians use insulin therapy to manage their diabetes,¹ including:
 - 1/3 with type 1 diabetes (T1D); 2/3 with type 2 diabetes (T2D); <4% other (e.g. gestational diabetes).
- Self-monitoring of blood glucose (SMBG) is an essential aspect of self-management for those using insulin therapy.²
- With appropriate training, SMBG enables people with diabetes to evaluate their glucose levels, detect high and low glucose, and respond by making changes to medication, food intake or physical activity.
- Guidelines suggest SMBG is needed 6-10 times per day for those using intensive insulin regimens (pump therapy, multiple daily injections).² Evidence is lacking for those using non-intensive therapies (e.g. basal insulin).²

Aim

- To explore frequency of SMBG among Australian adults with T1D and insulin-treated T2D, controlling for insulin delivery mode/intensity (i.e. frequency of injections/boluses and injections vs pump).
- To compare reasons for, and beliefs about, SMBG among Australian adults with T1D and insulin-treated T2D.

Method

Study Design

- This analysis uses cross-sectional data from the 'YourSAY (Self-management and You): Glucose Monitoring' national online survey, which explored:
 - SMBG practices, attitudes and barriers
- A convenience sample was recruited via social media (Twitter, Facebook), e-newsletter and website advertisements facilitated by Diabetes Australia and JDRF.

Data Collected

- Demographic and clinical characteristics included:
 - diabetes duration, complications, HbA1c (%)
 - insulin device, years using insulin, injections/boluses p/d
 - hypoglycaemia in past week & severe events in past 6 months: yes/no
 - hypoglycaemic awareness: Gold Score ≥ 4 indicates impaired awareness³
 - frequency of SMBG per day.
- 18 study-specific items (strongly disagree to strongly agree):
 - reasons for undertaking SMBG
 - positive beliefs about, or facilitators of, SMBG.

Participants

- Eligible participants were Australian adults (18-70 years) who self-reported:
 - T1D or T2D diabetes diagnosis
 - using insulin therapy (pump or injections)
 - not using a continuous glucose monitoring device.

Statistical Analysis

- Chi Square and t-tests were used to compare variables by diabetes type (T1D Vs T2D).
- Analysis of covariance was used to compare frequency, reasons for, and beliefs about SMBG by type, controlling for number of injections/boluses and insulin device.
- Results considered significant at $p < .05$.

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Table 2. Reasons for, and positive beliefs about, SMBG by diabetes type

Variable	% (strongly) agree		p value*
	T1D	T2D	
Reasons for SMBG: I check my blood glucose			
...to adjust my insulin	548 (93%)	64 (57%)	<0.001
...when I feel unwell	541 (91%)	92 (82%)	NS
...to avoid hyperglycaemia	524 (89%)	80 (71%)	0.003
...to avoid hypoglycaemia	515 (87%)	78 (70%)	0.014
...for my own peace of mind	500 (84%)	92 (82%)	NS
...to allow me to be active / exercise safely	458 (77%)	52 (46%)	<0.001
...to be safe while driving	435 (73%)	72 (64%)	NS
...to be able to eat as I want	396 (67%)	40 (36%)	<0.001
...because my health professional recommends it	316 (53%)	81 (72%)	0.003
...because the people close to me remind me to	122 (21%)	26 (23%)	NS
Positive beliefs about SMBG:			
I know what to do if I have a high / low BG reading	579 (98%)	94 (84%)	<0.001
I have a clear understanding of what my BG readings mean	557 (94%)	97 (87%)	0.005
I know how often to check my BG	554 (94%)	101 (90%)	NS
Checking my BG is important to me	542 (92%)	91 (81%)	NS
Checking my BG provides me with useful information	542 (92%)	91 (81%)	0.004
Checking my BG helps me to prevent complications	525 (89%)	92 (82%)	NS
Checking my BG helps me feel in control of my diabetes	442 (75%)	75 (67%)	NS
Checking my BG helps me achieve my HbA1c goals	435 (73%)	71 (63%)	NS

* Difference in mean scores, after controlling for insulin delivery mode/ intensity. Data are n(%), NS = $p > .05$. BG= Blood glucose.

Results

- Table 1 shows the demographic, clinical and psychosocial characteristics of the 704 participants by diabetes type.
- Compared to participants with T1D, those with T2D:
 - were significantly older with a shorter diabetes duration, had more diabetes-related complications, and a higher HbA1c
 - injected less frequently, and were less likely to have experienced hypoglycaemia in the past week, but
 - were as likely to have experienced severe hypoglycaemia in the past 6 months and to report impaired awareness of hypoglycaemia
 - conduct SMBG approximately half as many times per day.
- Regardless of insulin delivery mode/intensity, participants with T1D reported undertaking more SMBG per day than those with T2D ($F(1,689)=6.6, p=0.011$).
- Table 2 shows percentage agreement with reasons for, and positive beliefs about, SMBG, by diabetes type. All reasons for SMBG were more highly endorsed by those with T1D, than those with T2D, with the exception of "because my health professional recommends it".
- After adjusting for insulin delivery mode/intensity, participants with T1D were more likely, than those with T2D, to report their reasons for SMBG were:
 - to avoid high/low glucose levels, adjust insulin, exercise safely, and eat as they wish, but
 - those with T2D were more likely to report monitoring because their health professional recommends it.
- Overall, positive beliefs about SMBG were highly endorsed.
- After adjusting for insulin delivery mode/intensity
 - the following beliefs were similarly endorsed regardless of diabetes type: "I know how often to check my BG", and SMBG is "important", helps me to feel "in control", "achieve HbA1c my goals", and "prevent complications".
 - participants with T1D were significantly more likely than those with T2D to agree that SMBG provides useful information that they understand and know how to act upon.

Table 1. Sample characteristics

Variable	T1D	T2D
Total	592 (84%)	112 (16%)
Gender (women)	380 (64%)	68 (61%)
Age (years)	43 \pm 14	54 \pm 11***
Diabetes duration (years)	22 \pm 14	16 \pm 12***
Insulin: pump therapy	251 (42%)	2 (2%)***
Insulin injection / bolus per day	5 \pm 1	3 \pm 2***
Insulin duration (years)	-	6 \pm 5
HbA1c (%) ^a	7 \pm 1	8 \pm 2*
Diabetes-related complications: ≤ 1	208 (35%)	62 (55%)***
Hypoglycaemia: in past week ^b	402 (82%)	39 (50%)
Severe hypoglycaemia: in past 6 months ^b	84 (17%)	10 (13%)
Impaired awareness of hypoglycaemia: Gold Score ≥ 4 ^b	133 (27%)	23 (30%)
SMBG per day	6 \pm 3	3 \pm 3***

Data are n(%), mean \pm SD or Median(IQR). *** $p < .001$, * $p < .05$. ^aOnly reported if HbA1c checked within last 6 months. ^bParticipants asked only if reported having 'ever' experienced hypoglycaemia.

Conclusion

- Self-reported frequency of SMBG is greater among Australian adults with T1D, compared to those with T2D, regardless of insulin regimen intensity.
- This may be due to differing reasons for SMBG:
 - those with T1D were more likely to endorse reasons related to active diabetes management (e.g. adjust insulin, eat as wish, enable safe exercise, avoid hypoglycaemia/hyperglycaemia)
 - those with T2 were more likely to check because their health professional recommends it.
- Positive beliefs about SMBG were highly endorsed overall, but those with T1D appear to better understand and know how to respond to, their BG levels, compared to those with T2D.
- These findings may suggest that adults with insulin-treated T2D regardless of regimen intensity, rely more on professional-led management.

References

- National Diabetes Services Scheme (2016). Data Snapshot: type 2 diabetes; <https://www.ndss.com.au/data-snapshots>
- American Diabetes Association (2016). Diabetes Care: 39(supp 1): S39-S46
- Gold AE, Macleod KM, Frier BM (1994). Diabetes Care: 17(7):96-703