



Case Study

DRINKING ORANGE JUICE OR EATING ORANGE FRUIT: WHICH IS BETTER FOR GLYCEMIC CONTROL?

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ABSTRACT

The consumption of 100% fruit juice has been a subject of controversy due to abundance of free sugars leading to inconsistent dietary guidelines. This study aimed to verify the hypothesis if eating whole fruit scores better than drinking fruit juices in terms of glycemic control. 15 type-2 diabetic patients volunteered from author's online Diabetes Reversal Program to participate in the observational study. The relative effect of consumption of 300-ml orange FJ and 300-gram whole orange fruit on glycemic control was compared to verify the hypothesis. The findings of the study suggested that the consumption of oranges (whether juiced or eaten whole) is safe and well tolerable for diabetics and does not substantially raise the blood glucose levels in the average diabetic, however, individualized dietary modification would be the optimal practice to achieve desired health outcomes.

INTRODUCTION


Drinking 100% fruit juice (FJ) is a controversial topic with inconsistent dietary guidelines due to an abundance of free sugars and reduced level of soluble and insoluble fiber. However, FJ also provides bioavailable micronutrients and plant bioactive at levels similar to those found in whole fruits. The present trend encourages consumption of whole fruit as compared to fruit juice due to lower glycemic index and high fiber content. Fruit juices are often believed to be "bad" and "harmful" and often labelled as "sugar syrups" irrespective of numerous potential health benefits. This study aimed to verify the hypothesis if eating whole fruit scores better than drinking fruit juices in terms of glycemic control by comparing the relative effect of consumption of 300-ml orange FJ and 300-gram whole orange fruit on glycemic control.

AIMS

The study aimed to verify the hypothesis that eating whole fruit is better than drinking 100% FJ for glycemic control by comparing and evaluating the effect of consumption of 300-ml orange FJ and 300-gram of orange fruit on post-prandial glucose (PPG) levels measured after 1 hour and 2 hours and its deviation from fasting blood glucose (FBG).

METHODS

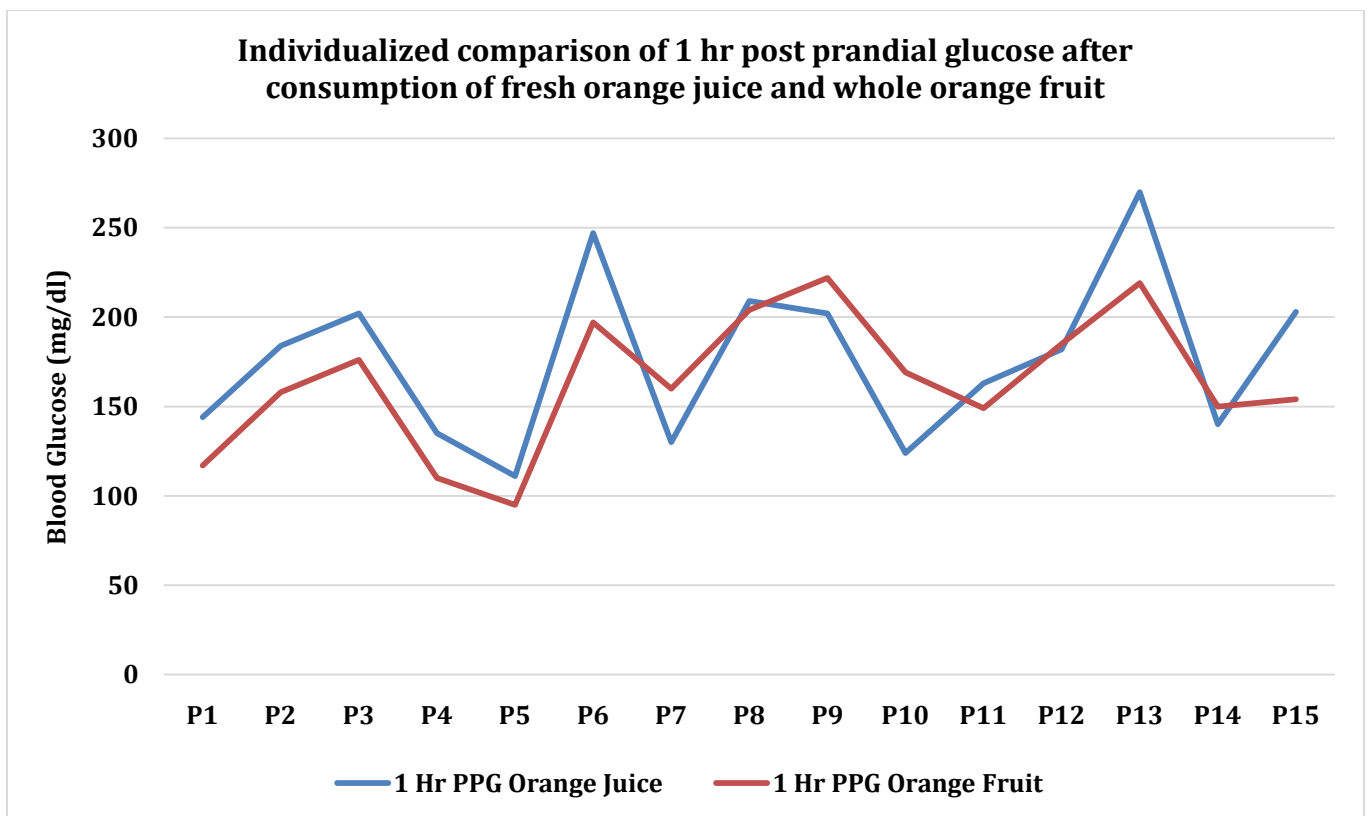
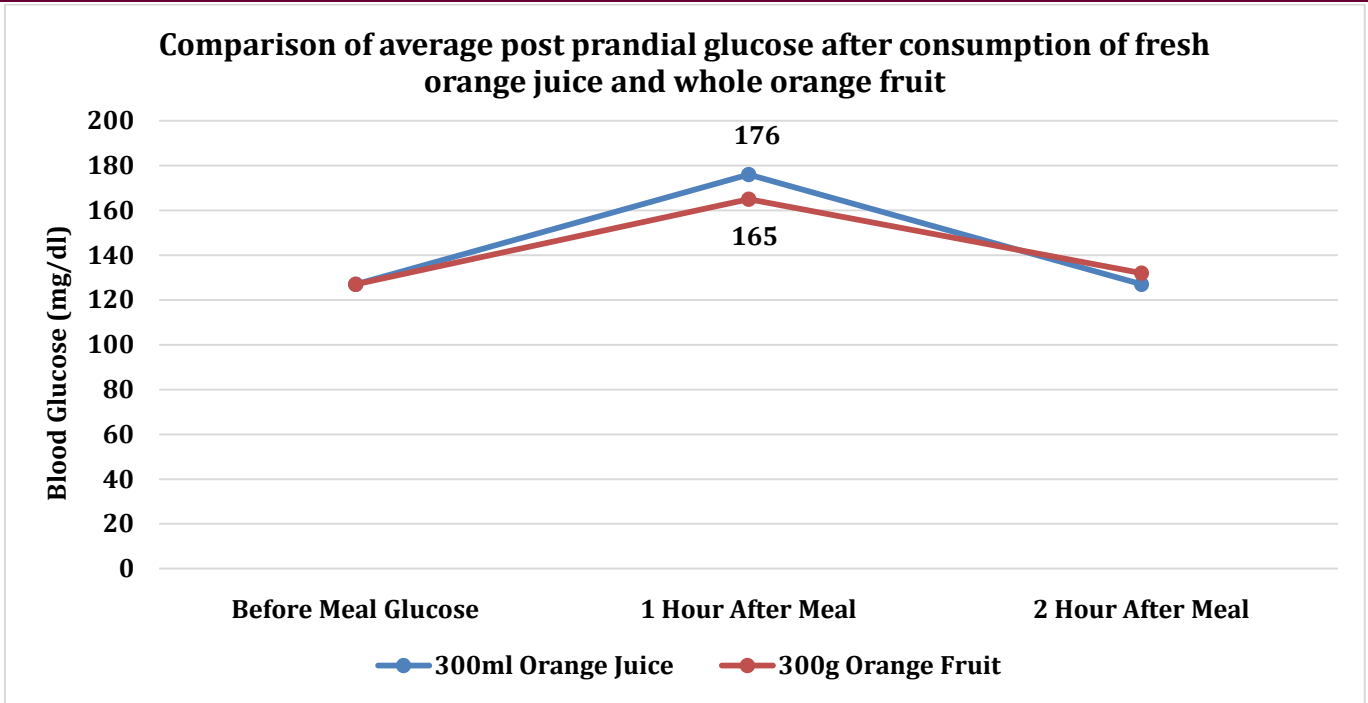
15 type-2 diabetic patients volunteered from author's online Diabetes Reversal Program to participate in the study. The volunteers were recruited online from Canada, USA, UK, Australia, Italy, and India. None of the patients were insulin dependent. On day 1, they drank 300-ml orange FJ on empty stomach in the morning and measured the difference between FBG and PPG. On day 2, they ate 300-gram whole orange fruit on empty stomach in the morning and measured the difference between FBG and PPG. The relative effect of consumption of 300-ml orange FJ and 300-gram whole orange fruit on parameters of glycemic control was compared to verify the hypothesis that eating whole fruit is better than drinking 100% fruit juice.

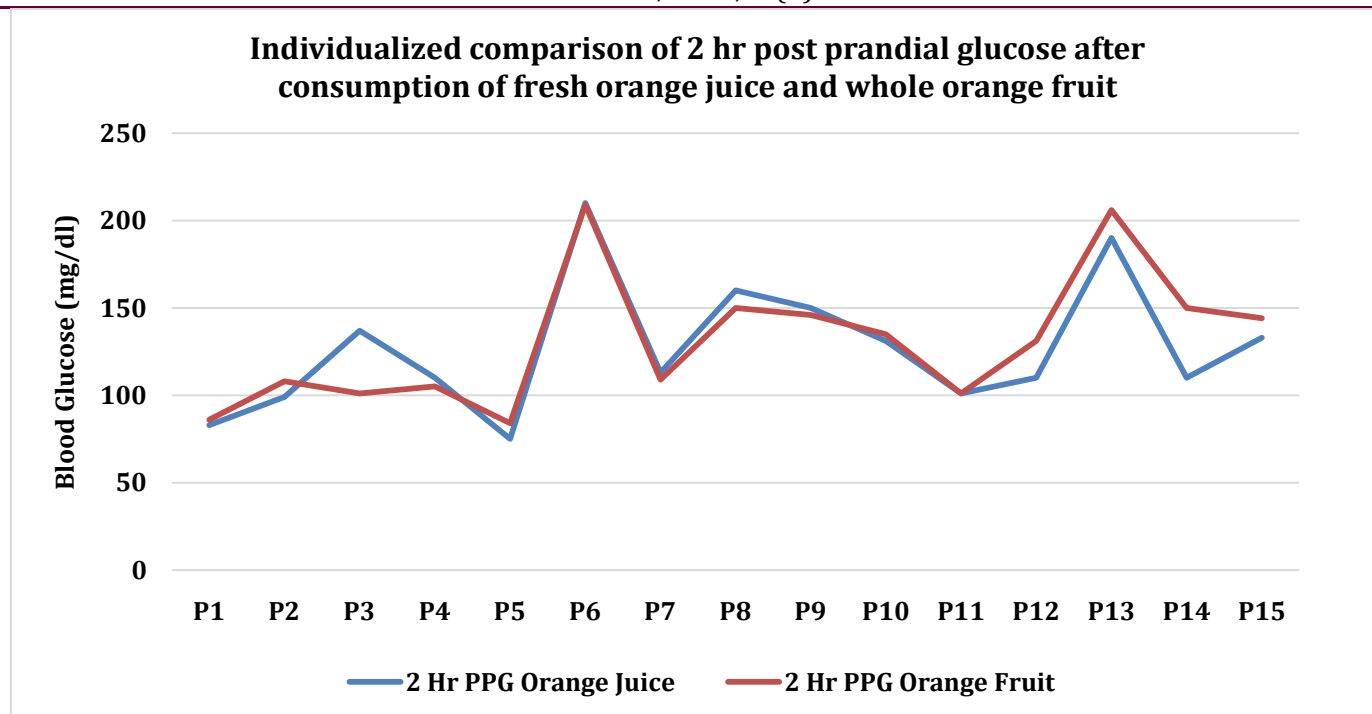
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RESULTS

Participant No.	Name	Location	FBG	1Hr PPG	Change	2Hr PPG	Change
P1	V K	Canada	119	144	+ 25	83	- 36
P2	K S	Canada	94	184	+ 90	99	+5
P3	G S	Canada	148	202	+ 54	137	- 11
P4	P S	Canada	105	135	+ 30	110	+ 5
P5	G R	USA	96	111	+ 15	75	- 21
P6	M S	USA	171	247	+ 76	210	+ 39
P7	B C	USA	101	130	+ 29	113	+ 12
P8	B Z	USA	233	209	- 24	160	- 73
P9	B S	USA	133	202	+ 69	150	+ 17
P10	K K	UK	108	124	+ 16	131	+ 23
P11	V S	UK	95	163	+ 68	101	+ 6
P12	S S	UK	112	182	+ 70	110	- 2
P13	H S	India	175	270	+ 95	190	+ 15
P14	H K	India	112	140	+ 28	110	- 2
P15	D K	Italy	106	203	+ 97	133	+ 27
Total			1908	2646	+ 738	1912	+ 4
Average			127	176	+ 49	127	0

Participant No.	Name	City	FBG	1Hr PPG	Change	2Hr PPG	Change
P1	V K	Canada	126	117	- 9	86	- 40
P2	K S	Canada	104	158	+ 54	108	+ 4
P3	G S	Canada	122	176	+ 54	101	- 21
P4	P S	Canada	108	110	+ 2	105	-3
P5	G R	USA	80	95	+ 15	84	+ 4
P6	M S	USA	165	197	+ 32	209	+ 44
P7	B C	USA	120	160	+ 40	109	- 11
P8	B Z	USA	141	204	+ 63	150	+ 9
P9	B S	USA	131	222	+ 91	146	+ 15
P10	K K	UK	121	169	+ 48	135	+ 14
P11	V S	UK	117	149	+ 32	101	- 16
P12	S S	UK	110	185	+ 75	131	+ 21
P13	H S	India	214	219	+ 5	206	- 8
P14	H K	India	120	150	+ 30	150	+ 30
P15	D K	Italy	110	154	+ 44	144	+ 34
Total			1889	2465	+ 576	1965	+ 76
Average			126	164	+ 38	131	+ 5





The above tables and graph show the relative effect of consumption of 300ml orange FJ and 300gm whole orange fruit on the blood glucose levels of the patients. On average, a slight difference between 1 hr. PPG (11mg/dl) of both meals was observed. However, there was negligible difference between 2 hr PPG (5mg/dl). When observed individually, the majority of the participants had a higher glycemic response to orange FJ. The 1 hr. PPG for orange FJ had a significant spike (>60mg/dl) for some patients (P6, P13, P15). Interestingly, in the comparison of 1 hr PPG, some participants (P7, P9, P14) seemed to have a higher glycemic response to whole orange fruit than orange FJ. Furthermore, a negligible difference was observed between 2 hr PPG after consumption of whole orange fruit and orange FJ in most of the participants. On average, there was a negligible difference between the deviation of average 2 hr. PPG from average FBG, in orange FJ group (0), and whole orange fruit group (+5 mg/dl). One participant (P14) got mild episodes of cough after eating/drinking oranges. No other negative outcomes were reported by the participants.

DISCUSSION

Fruit juices are usually a subject of controversy owing to the presence of free sugars and a lesser amount of dietary fiber than in fresh fruits.^[1] However, a recent review of studies stated that moderate consumption of 100% juices not only does not have negative effects on human health, but on the contrary improves the health of the organism.^[2] Its intake helps lower blood pressure and the content of highly sensitive C-reactive protein, thereby reducing the risk of cardiovascular diseases. There is no established correlation between moderate fruit juice consumption

and the onset of type 2 diabetes. In a meta-analysis of 18 RCTs in 2017 it was found that 100% fruit juice had no significant effect on fasting blood glucose, fasting blood insulin, insulin resistance, or HbA1c.^[3] These findings are consistent with findings from some observational studies suggesting that consumption of 100% fruit juice is not associated with increased risk of diabetes.

The glycemic index of the juices is low or medium, which differentiates them from typical soft drinks containing sugar. The risk of obesity does not increase with the consumption of juices (100-500ml/day). Negative effects, such as obesity and an increased risk of diabetes, may only be detected with excessive consumption of juices. Based on data from some studies, individuals with high consumption of sugar sweetened beverages (SSBs) had a 26% greater risk of developing type 2 diabetes.^[4] Results from a meta-analysis in 2014 suggested that a greater intake of sugar sweetened fruit juice was associated with a 14% higher risk of incident type 2 diabetes while 100% fruit juice had no effect.^[5] In another study a higher percentage of fruit juice consumers met the average requirement for vitamin A, vitamin C, folate, magnesium, and potassium as compared to non-consumers.^[6]

In our present study, a negligible difference was observed between the deviation of average 2 hr. PPG from average FBG, in both the groups: orange FJ group (0), and whole orange fruit group (+5mg/dl) highlighting that consumption of oranges (whether juiced or eaten whole) is well tolerated by majority of the participants. The findings from this study suggest that a moderate intake of both fruit juice and whole

fruit is safe and well tolerable for diabetics and does not substantially raise the blood glucose levels in the average diabetic, however, individualized dietary modification certainly would be the best potential practice to achieve optimal health outcomes.

CONCLUSIONS

Eating whole fruit may provide a better 1 hr. PPG control as compared to 100% fresh fruit juice. However, the difference is negligible in the 2 hr. PPG levels. Overall, consumption of whole fruit seems to be a better choice for glycemic control as compared to 100% fresh fruit juices. A moderate intake of fruit juice is safe for diabetics, but individualized dietary modification is important to implement the observations.

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