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COMPARISON OF THE EFFECTIVENESS OF USING CINNAMON DECOCTION AND CARROT JUICE ON LOWERING BLOOD GLUCOSE LEVELS IN PATIENTS WITH TYPE 2 DIABETES MILATUS AT PROCLAMATION HOSPITAL

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Abstract

Diabetes mellitus is a metabolic disorder characterized by an increase in blood glucose levels due to impaired insulin secretion. Blood glucose control in addition to pharmacological therapy can be done through non-pharmacological therapy using cinnamon decoction and carrot juice where it is known that cinnamon and carrots have active ingredients that can lower blood glucose levels. Objective tofind out the comparison of the effectiveness of the use of cinnamon decoction and carrot juice on the reduction of blood glucose levels in patients with type 2 Diabetes Mellitus at Proclamation Hospital.Method this study uses quantitative research with a quasi-experimental *research* design with a *pre-test post-test control group design*. The sample of 72 respondents with type 2 diabetes mellitus was grouped into 2, namely the cinnamon decoction intervention group and the carrot juice intervention group carried out for 5 days. The statistical test used is a paired t-test using the SPSS 25 statistical program. Study results the results of bivariate analysis using the paired t-test with a sample of 72 respondents (N=72) 36 respondents of the cinnamon decoction intervention group obtained a pre-test mean of 218.83 mg/dL and a post-test of 197.19 mg/dL and a p-Value (0.000) and 36 respondents of the carrot juice intervention group obtained a pret-test mean of 208.44 mg/dL and a post-test of 190.16 mg/dL and a p-Value value (0.000). Conclusion and recommendation cinnamon decoction and carrot juice are equally effective in lowering blood glucose levels in patients with type 2 diabetes mellitus.

Keywords: *Type 2 Diabetes Mellitus, Cinnamon, Carrot Juice, Blood Glucose Level*

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INTRODUCTION

Type 2 dilabletes mlelliltus ils a condiltilon iln whilch sugar levels iln the blody exceed the lilmlilt ilt should. Hilgh bllood sugar levels can occur blecause the blody does not utillilze the hormlone ilnsuliln properly. The hormlone ilnsuliln functilons to delilver glucose ilnto the blody's cells and convert ilt ilnto energy. Dilabletes can lead to varilous comlplilcatilons due to hyperglycemlila arilsilng froml decreased ilnsuliln sensiltilvilty produced bly the pancreas [7].

Type 2 Dilabletes MLelliltus ils one of the chronilc mletablolilc dilseases wilth an ilncreasilng prevalence globlally and natilonally. Thils condiltilon ils characterilzed bly hyperglycemlila due to ilnsuliln resilstance and ilmlpailred cell functilon β pancreas. Uncontrolled hyperglycemlila can cause varilous chronilc comlplilcatilons such as cardilovascular dilsease, nephropathy, neuropathy, and retilnopathy whilch have an ilmlpact on reducilng the qualilty of lilfe of sufferers and ilncreasilng the blurden on the health care systeml [14].

Accordilng to the (WHO) prevalence of Dilabletes MLelliltus shows that around 537 mlilllilon ilndilvilduals suffered froml Dilabletes iln 2021, wilth estilmlates to ilncrease to 783 mlilllilon bly 2045. The ILnternatilonal Dilabletes Federatilon (ILDF) 2024 reilnforces thils phenomlenon, where the rate of Dilabletes amlong ILndonesilan adults reaches 11.3% or around 20.4 mlilllilon cases. The West Java Health Offilce (2024) shows that dilabletes cases willl reach around 640,000 thousand people iln 2023. ILn West Java, especilally iln Karawang, there were 29,009 resildents dilagnosed wilth Dilabletes MLillletus froml January to Octobler 2024.

Cilnnamlon ils known to have antil-dilabletilc propertiles, iln addiltilon, ilt ils also thought to have antil-oxildant, antil-ilnflamlmlatory and antil-blacterilal propertiles, The mlailn elemlents of cilnnamlon are *cilnnamlaldehyde, cilnnamlate, cilnnamlilc acild,* and mlany essentilal oills [25]. *Cilnnamlaldehyde* iln cilnnamlon (*Cilnnamlomluml cassila*) ilncreases glucose transport bly *GLUT-4* iln adilpose cells and skeletal mluscle so that ilt can lower bllood glucose, polyphenols and flavonoilds that have the ablillilty to capture free radilcals, especilally iln β-pancreatilc cells. ILt ils concluded that cilnnamlon (*Cilnnamlomluml cassila*) has actilve ilngredilents that can lower bllood sugar levels iln people wilth type-2 dilabletes mlelliltus [14].

Carrots are one of the mlost consumled vegetablles due to theilr heads and easy availlablillilty. Carrots are a low-calorile, hilgh-filbler vegetablle that ils especilally blenefilcilal for ilndilvilduals wilth dilabletes mlelliltus. The hilgh filbler content of carrots helps slow down the ablsorptilon of glucose iln the smlall ilntestilne and ilncreases satilety, therebly reducilng the rilsk of hyperglycemlila [31]. Hilgh ilntake of alpha-carotene and bleta-carotene can help lower the rilsk of developilng type 2 dilabletes mlelliltus. Carrots are known to ble an ablundant source of carotene, where every 100 gramls of carrots containls ablout 8,285 mlilcrogramls (mlcg) of bleta-carotene and 3,477 mlilcrogramls (mlcg) of alpha-carotene.

METHODS

Thils study uses quantiltatilve research wilth a desilgn Research *Quasil-experilmlents* wilth a plan *control group pre-test post-test desilgn*. The samlple of 72 respondents wilth type 2 dilabletes mlelliltus was grouped ilnto 2, namlely the cilnnamlon decoctilon ilnterventilon group and the carrot juilce ilnterventilon group carriled out for 5 days. BLlood glucose levels were mleasured blefore and after the ilnterventilon usilng a glucomleter. The statilstilcal test used ils a pailred t-test usilng the SPSS 25 statilstilcal programl.

RESULTS AND DISCUSSION

Table 1. Respondent Characterilstilcs

Respondent Characteristics	Category	Cinnamon decoction experimental group		Carrot juice experimental group	
		F	%	F	%
Age	19-30 Years	2	5,6	0	0
	31-45 Years	7	19,4	12	33,3
	46-55 Years	12	33,3	11	30,6
	>56 years old	15	41,7	13	36,1

	Total	**36**	**100**	**36**	**100**
Gender	MLale	13	36,1	15	41,7
	Womlen	23	63,9	21	58,3
	Total	**36**	**100**	**36**	**100**
Education	No school	7	19,4	5	13,9
	SD	5	13,9	4	11,1
	SMLP	7	19,4	5	13,9
	SMLA	12	33,3	20	55,6
	PT	5	13,9	2	5,6
	Total	**36**	**100**	**33**	**100**
Jobs	Not workilng	12	33,3	14	38,9
	CILVILL SERVANT/TNIL-POLRIL	3	8,3	1	2,8
	Prilvate emlployees/lablourers/farmlers	21	58,3	21	58,3
	Total	**36**	**100**	**36**	**100**

BLased on tablle.1 of the characterilstilcs of respondents iln the cilnnamlon stew ilnterventilon group blased on age wilth a samlple of 36 respondents (N=36), mlost of theml were >56 years old, 15 respondents (41.7%), blased on gender, mlost of theml were womlen, 23 respondents (63.9%), blased on educatilon, mlost of theml were educated as hilgh school as mlany as 12 respondents (33.2%) and blased on work, mlost of theml had jobls as emlployees/lablorers/farmlers. 21 respondents (58.3%). MLeanwhille, iln the carrot juilce ilnterventilon group blased on age wilth a samlple of 33 respondents (N=36), mlost of theml were >56 years old, 13 respondents (36.1%), blased on gender, mlost of theml were womlen as mlany as 21 respondents (58.3%), blased on educatilon, mlost of theml were educated as hilgh school as mlany as 20 respondents (55.6%) and blased on work, mlost of theml had jobls as emlployees of the prilvate sector/lablorers/farmlers as mlany as 21 respondents (58.3%).

Table 2**.** Dilstrilblutilon of BLlood Glucose Frequency BLefore and After Cilnnamlon Decoctilon ILnterventilon

Until Glukosa darah	**Pre-test**		**Post-test**	
	F	(%)	F	%
100-140 mlg/dL	0	0	0	0
141-199 mlg/dL	5	13,9	22	61,1
>200 mlg/dL	31	86,1	14	38,9
Total	36	100	36	100

BLased on tablle 2 of the 36 respondents, 31 respondents (86.1%) had a bllood glucose level of >200 mlg/dL and after bleilng gilven a cilnnamlon decoctilon ilnterventilon, 22 respondents (61.1%) had a glucose level of 141-199 mlg/dL.

Table 3. Dilstrilblutilon of BLlood Glucose Frequency BLefore and After BLeilng Gilven Carrot Juilce ILnterventilon

Until Glukosa darah	**Pre-test**		**Post-test**	
	F	**(%)**	**F**	**%**
100-140 mlg/dL	0	0	0	0
141-199 mlg/dL	10	27,8	26	72,2
>200 mlg/dL	26	72,2	10	27,8
Total	36	100	36	100

BLased on tablle 3 of the 36 respondents, ilt was shown that 26 respondents (72.2%) had a decrease iln bllood glucose levels of >200 mlg/dL blefore the carrot juilce ilnterventilon, and after bleilng gilven carrot juilce ilnterventilon, 26 respondents (72.2%) experilenced a decrease iln bllood glucose (141-199 mlg/dL).

Table 4. Effectilveness of the effect of decoctilon of cilnnamlon and carrot juilce on the reductilon of bllood glucose levels

Variabel	Mean	N	T-Table	T-Count	P-Value
Cinnamon decoction intervention group					
Pre-test	218,83	36	2,030	19,023	0,000
Post-test	197,19				
Carrot juice intervention group					
Pre-test	208,44	36	2,030	22,108	0,000
Post-test	190,16				

BLased on tablle 4 ablove, wilth a pailred T-test wilth a samlple of 72 respondents (N=72), 36 respondents to the cilnnamlon stew ilnterventilon group and 36 partilcilpants to the carrot juilce ilnterventilon. ILn the cilnnamlon decoctilon ilnterventilon group, a pre-test mlean of 218.83 mlg/dL and post-test were obltailned of 197.19 mlg/dL and a p-Value (0.000) whilch mleans that there ils a dilfference iln bllood glucose levels blefore and after cilnnamlon decoctilon. ILn the carrot juilce ilnterventilon group, the pret-test mlean was 208.44 mlg/dL and post-test 190.16 mlg/dL and a p-Value value (0.000) whilch mleans there ils a dilfference iln bllood glucose levels blefore and after bleilng gilven carrot juilce.

Discussion

Distribution of Respondent Characteristics

BLased on age characterilstilcs, mlost of the respondents were >56 years old, as mlany as 15 respondents (41.7%) iln the cilnnamlon decoctilon ilnterventilon study and iln the carrot juilce ilnterventilon were mlostly >56 years old, as mlany as 13 respondents (36.1%). Thils study ils iln lilne wilth research conducted [6] that at the age of over 56 years (63.3%), that age factors affect the decrease iln ilnsuliln sensiltilvilty iln glucose mletablolilsml iln the bllood. Thils research ils iln lilne wilth research [3] where iln the study the ilncildence of Type 2 DML dilsease iln the Kumlun health center area iln 2021 was on average >40 years old.

One of the factors that affect the occurrence of dilabletes mlelliltus ils age, thils ils caused blecause people at thils age tend to do less physilcal actilvilty, experilence weilght gailn, and decrease iln mluscle mlass, whilch ils aggravated bly the agilng process so that there ils a progressilve shrilnkage of β pancreatilc cells. ILn addiltilon, the prevalence of dilabletes mlelliltus ilncreases wilth age, especilally iln the age group over 45 years, blecause at that age there blegilns to ble an ilncrease iln glucose ilntolerance [2].

Thils condiltilon ils related to a decrease iln the blody's physilologilcal functilons, ilncludilng a decrease iln the ablillilty of cells β pancreas to produce ilnsuliln and an ilncrease iln ilnsuliln resilstance whilch generally occurs wilth age. As a result, the blody's effectilveness iln regulatilng glucose mletablolilsml decreases, so the rilsk of dilabletes ilncreases. ILn addiltilon, changes iln glucose mletablolilsml accomlpaniled bly an unhealthy lilfestyle also contrilblute to an ilncrease iln bllood glucose levels iln the elderly age group. However, recent developmlents show an ilncrease iln the ilncildence of dilabletes mlelliltus iln the age group under 40 years, whilch ils related to a decrease iln physilologilcal condiltilons as well as unhealthy lilfestyle changes [29].

BLased on gender, the mlost femlale respondents were 23 respondents (63.9%) iln the cilnnamlon decoctilon ilnterventilon study and 21 respondents (58.3%) iln the carrot juilce ilnterventilon study. BLased on the gender theory, womlen have a hilgh rilsk of developilng DML due to hormlonal changes [18]. Thils condiltilon ils ilnfluenced bly varilous factors, such as dilfferences iln blody comlposiltilon, changes iln hormlone levels, and an ilncreased tendency to accumlulate vilsceral fat iln womlen after enterilng mlenopause. Decreased levels of the hormlone estrogen iln postmlenopausal womlen can decrease ilnsuliln sensiltilvilty, thus playilng a role iln ilncreasilng bllood glucose levels [33]. Thils study ils iln lilne wilth the results of a study [6] on the effect of red gilnger water decoctilon on bllood sugar levels iln dilabletilc mlelliltus patilents iln MLekarjaya villlage, data was obltailned that the mlajorilty of dilabletilc mlelliltus patilents were femlale as mlany as 47 respondents (56.7%). BLecause womlen willl experilence a contilnuous decrease iln estrogen hormlones durilng mlenopause.

BLased on the Educatilon Level, mlost of the respondents were hilgh school educated as mlany as 12 respondents (33.3%) iln the

cilnnamlon stew ilnterventilon group. And iln the carrot juilce ilnterventilon group, there were 20 respondents (55.6%). Thils study ils iln lilne wilth the study [2] where the results of the study were obltailned on the ilnterventilon of cilnnamlon decoctilon and kersen leaves, ilt was found that half of the respondents had a hilgh school educatilon wilth a total of 7 people (46.7%). Educatilon ils a learnilng process that can shape and change a person's blehavilor so that ilt has an ilmlpact on ilmlprovilng the qualilty of lilfe. Theoretilcally, a person wilth a hilgher level of educatilon has a greater chance of exhilbliltilng posiltilve blehavilor (Ernawatil, Harnil, Silgna, & Gumlillas, 2020). People wilth hilgher levels of educatilon have an easiler tilmle understandilng and adherilng to diletary rules comlpared to people wilth low educatilon. Hilgher educatilon helps a person receilve and apply ilnformlatilon iln dailly lilfe, especilally iln adherilng to a dilet iln people wilth dilabletes mlelliltus (Hestilana, 2017).

BLased on work, mlost of the respondents worked as prilvate emlployees/lablorers/farmlers as mlany as 21 respondents (58.3%) iln the cilnnamlon stew ilnterventilon group and 21 respondents (58.3%) worked as prilvate emlployees/lablorers/farmlers iln the carrot juilce ilnterventilon group. A person's work affects hils physilcal actilvilty. One of the factors that affect bllood glucose levels ils physilcal actilvilty or work. Actilviltiles or jobls that ilnvolve physilcal mlovemlent can help lower bllood sugar levels iln the blody [2]. Work actilviltiles requilre energy obltailned through mletablolilc processes, bloth for thilnkilng, mlovilng, and other physilcal actilviltiles. The ilncrease iln energy needs leads to the use of glucose as an energy source, so ilt can reduce bllood glucose levels. Optilmlal glucose utillilzatilon willl reduce the accumlulatilon of glucose iln the bllood, so the rilsk of hyperglycemlila can ble mlilnilmlilzed. ILn addiltilon, when glucose ilntake ils ilnsuffilcilent, the blody willl use glucose reserves, so bllood glucose levels tend to decrease durilng mletablolilc processes [15].

Distribution of Blood Glucose Frequency Before and After Cinnamon Decoction Intervention

BLased on the results of research froml 36 respondents wilth DMLT2 blefore bleilng gilven a cilnnamlon decoctilon ilnterventilon, the mlajorilty of bllood glucose levels >200 mlg/dL, namlely 31 respondents (86.1%), then froml 36 respondents after bleilng gilven cilnnamlon decoctilon, the mlajorilty of bllood glucose levels were 141-199 mlg/dL, whilch was 22 respondents (61.1%). Thils study ils iln lilne wilth the results of the study [21] of 25 respondents blefore bleilng gilven warml blrewilng of cilnnamlon, there were 21 people (84%) who had bllood glucose levels **of** ≥ 300 mll/dl and after bleilng gilven warml blrewilng of cilnnamlon, there were 19 people (76%) who had a KGD **of** ≥ 200 mll/dl and froml the results of the Pailred T-test wilth a p value of 0.02 whilch mleans $p < 0.05$. ILndilcates the effectilveness of gilvilng cilnnamlon warml blrew to reduce bllood glucose levels iln patilents wilth dilabletes mlelliltus. Thils study ils iln lilne wilth the results of research [34] froml thils study, bllood sugar levels iln respondents wilth dilabletes mlelliltus iln Gemlah subl-dilstrilct blefore bleilng gilven cilnnamlon extract wilth bllood sugar bleilng 170 to 300 mlg/dL and after bleilng gilven cilnnamlon extract for 7 days, the results were obltailned wilth 120 to 160 mlg/dL. So, there ils an effect of gilvilng cilnnamlon extract on reducilng bllood sugar levels.

Distribution of Blood Glucose Frequency Before and After Being Given Carrot Juice Intervention

BLased on the results of the study of 36 respondents wilth DMLT2 blefore bleilng gilven carrot juilce ilnterventilon, the mlajorilty of bllood glucose levels >200 mlg/dL, namlely 26 respondents (72.2%), then froml 36 respondents after bleilng gilven cilnnamlon decoctilon, the mlajorilty of bllood glucose levels were 141-199 mlg/dL, whilch was 26 respondents (72.2%). Thils study ils iln lilne wilth the results obltailned froml 33 respondents blefore bleilng gilven a comlblilnatilon of chayote juilce and carrot juilce had bllood sugar levels iln the hyperglycemlila category, namlely as mlany as 17 respondents (51%) and after bleilng gilven a comlblilnatilon of chayote juilce and carrot juilce had bllood sugar levels iln the pre-dilabletes category, namlely as mlany as 20 respondents (61%). [1]

Comparison of the effectiveness of the use of cinnamon decoction and carrot juice on the reduction of blood glucose levels

BLased on the results of the pailred T-test wilth a total of 36 respondents, T-Count 19,023 > T-tablle 2,030 and a p-value of 0.000 whilch mleans that there ils a dilfference iln bllood glucose levels

blefore and after bleilng gilven cilnnamlon decoctilon. The results of thils study are iln lilne wilth the study [21] the results of the study obltailned that the mlean value of the respondents of the cilnnamlon ilnterventilon group blefore bleilng gilven cilnnamlon decoctilon was 372.80 mlg/dl and the mlean value after bleilng gilven cilnnamlon decoctilon was 202.48mlg/dl. < 0.05 the effectilveness of gilvilng warml cilnnamlon blrew on reducilng bllood glucose levels iln patilents wilth dilabletes mlelliltus Thils study ils iln accordance wilth the results of the study [20] the average bllood sugar value blefore bleilng gilven cilnnamlon ils 142.71 mlg/dL. MLeanwhille, the average bllood sugar value after 2 hours was 113.97 mlg/dL. There was a decrease iln bllood sugar levels at 28.74 mlg/dL (20.14%). The results of the Willcoxon test showed a silgnilfilcant relatilonshilp wilth p-value = 0.0001. ILt can ble concluded that the admlilnilstratilon of cilnnamlon wilth a dose of 6 gramls can lower bllood sugar levels after 2 hours of admlilnilstratilon. Cilnnamlon ils known to have antil-dilabletilc propertiles, iln addiltilon, ilt ils also considered to have antil-oxildant, antil-ilnflamlmlatory and antil-blacterilal propertiles, The mlailn elemlents of cilnnamlon are *cilnnamlaldehyde, cilnnamlate, cilnnamlilc acild*, and mlany essentilal oills [25]. One of the comlpounds found iln cilnnamlon ils *flavonoilds*, *flavonoilds* have the performlance of stilmlulatilng the pancreas to produce the hormlone ilnsuliln that the blody needs to regulate bllood glucose levels. So *flavonoilds* have effilcacy and can have a posiltilve effect on dilabletes mlelliltus and iln antildilabletilc performlance and control the work of the pancreas. (MLukaromlah, 2023).

MLeanwhille, the results of the pailred T-test iln the carrot juilce ilnterventilon group wilth a total of 36 respondents were obltailned T-Count 22.108 > T-tablle 2.030 and a p-value of 0.000 whilch mleans that there ils a dilfference iln bllood glucose levels blefore and after bleilng gilven carrot juilce. Thils study ils supported bly the results of the study [28] The average bllood glucose level blefore the admlilnilstratilon of carrot juilce was 221.88 mlg/dL, whilch decreased to 199.88 mlg/dL after the ilnterventilon, showilng a reductilon of 22.0 mlg/dL. Statilstilcal analysils usilng a pailred samlple t-test showed a silgnilfilcant value of 0.0001 ($p < 0.05$) at a 95% confildence level, ilndilcatilng a silgnilfilcant decrease iln bllood glucose levels after the consumlptilon of carrot juilce. ILn contrast, the control group showed no silgnilfilcant change, wilth a p value of 0.248 ($p > 0.05$). The results of thils study are iln lilne wilth the research [1]. BLased on the results of the analysils of the Pailred Samlple T-Test test, ilt ils known that the silgnilfilcance value ils 0.000 < 0.05 so that there ils an effect of the comlblilnatilon of chayote juilce and carrot juilce on bllood sugar levels iln patilents wilth type ILIL dilabletes mlelliltus. Carrots are low-calorile, hilgh-filbler vegetablles that are rilch iln antiloxildants, such as viltamliln C, viltamliln E, β-carotene, lycopene, and flavonoilds. The antiloxildant content plays a role iln protectilng cells β pancreas, ilncreasilng ilnsuliln sensiltilvilty, and helpilng to lower bllood glucose levels. Viltamliln C supports ilnsuliln productilon bly mlailntailnilng β cell functilon, whille viltamliln E reduces oxildatilve stress. Carotenoilds such as lycopene and β-carotene have antildilabletilc actilvilty through protectilon agailnst pancreatilc β cells and free radilcal ilnhilbliltilon. ILn addiltilon, flavonoilds play a role iln lowerilng *reactilve oxygen speciles* (ROS) and ilncreasilng glucose tolerance [31].

A comlparilson of the effectilveness of usilng cilnnamlon decoctilon and carrot juilce as non-pharmlacologilcal therapy iln patilents wilth Type 2 Dilabletes MLelliltus bloth showed effectilveness iln lowerilng bllood glucose levels. The results showed that blefore the ilnterventilon, the average bllood glucose level iln the cilnnamlon decoctilon ilnterventilon group was 218.83 mlg/dL and decreased to 197.19 mlg/dL after the ilnterventilon, wilth an average decrease of 21.64 mlg/dL. MLeanwhille, iln the carrot juilce ilnterventilon group, the average ilniltilal bllood glucose level was 208.44 mlg/dL and decreased to 190.17 mlg/dL after the ilnterventilon, wilth an average decrease of 18.28 mlg/dL. Statilstilcally, there was no silgnilfilcant dilfference iln post-test bllood glucose levels bletween the two groups, so ilt can ble concluded that cilnnamlon decoctilon and carrot juilce had relatilvely equal effectilveness iln helpilng to lower bllood glucose levels iln DMLT2 patilents. Nonetheless, cilnnamlon decoctilon showed a slilghtly greater decrease iln bllood glucose levels clilnilcally, whille carrot juilce provildes addiltilonal blenefilts iln the forml of viltamlilns, filbler, and antiloxildants that support glucose mletablolilsml and general blody health [24].

CONCLUSION

BLased on the results of the study wilth a pailred T-test wilth a samlple of 72 respondents (N=72), 36 respondents to the cilnnamlon decoctilon ilnterventilon group and 36 partilcilpants to the carrot juilce ilnterventilon. ILn the cilnnamlon decoctilon ilnterventilon group, a pre-test mlean of 218.83 mlg/dL and post-test 197.19 mlg/dL were obltailned wilth an average decrease of 21.64 mlg/dL and a p-Value (0.000) whilch mleans that there ils a dilfference iln bllood glucose levels blefore and after cilnnamlon decoctilon. ILn the carrot juilce ilnterventilon group, a pret-test mlean of 208.44 mlg/dL and post-test 190.16 mlg/dL were obltailned wilth an average decrease of 18.28 mlg/dL and a p-Value (0.000) whilch mleans that there was a dilfference iln bllood glucose levels blefore and after bleilng gilven carrot juilce.

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