International Journal of Health Sciences
Available online at www.sciencescholar.us
E-ISSN: 2550-696X
Int. J. of Health Sci.
DOI: 10.53730

How to Cite:
Ahmed, M. M., Ismail, M. A. R., Mohamed, S. F., Ahmed, S. A., & Zeid, W. A. (2025). Effect of chromium on glycemic control among patients with diabetes mellitus attending family medicine clinic, Suez Canal University Hospitals, Ismailia Governorate, Egypt. *International Journal of Health Sciences*, *9*(S1), 161–174. https://doi.org/10.53730/ijhs.v9nS1.14344

Effect of chromium on glycemic control among patients with diabetes mellitus attending family medicine clinic, Suez Canal University Hospitals, Ismailia Governorate, Egypt

Moustafa Mahmoud Ahmed
Family Medicine Department, Qena Faculty of Medicine, South Valley University

Mosleh Abdel Rahman Ismail
Family Medicine Department, Faculty of Medicine, Suez Canal University

Samar Farag Mohamed
Family Medicine Department, Faculty of Medicine, Suez Canal University

Safwat A. Ahmed
Pharmacognosy Department, Faculty of Pharmacy, Suez Canal University

Wael Ahmed Zeid
Family Medicine Department, Faculty of Medicine, Suez Canal University

***Abstract*---Background**. Diabetes mellitus is a serious worldwide health issue and a chronic illness. Approximately 463 million persons between the ages of 20 and 79 have diabetes, which accounts for 9.3% of the global population in this age range. With a current national prevalence of 15.2% and 8.9 million people with diabetes, Egypt ranks the ninth out of ten nations in this category. Chromium is a trace and a necessary element, which may decrease glucose tolerance. **Objectives:** To determine the effect of chromium on glycemic control among patients with diabetes mellitus attending the family medicine clinic, Suez Canal University hospitals, and to identify the reported side effect. **Patients and methods:** A double blinded randomized

***Corresponding author**: Ahmed, M.M.; Email: Moustafa.Mahmoud@med.svu.edu.eg*
Submitted: 09 October 2024, Revised: 18 December 2024, Accepted: 25 January 2025

controlled clinical trial was conducted at the family medicine clinic, Suez Canal University hospitals in Ismailia Governorate, Egypt. Socioeconomic status was determined using El-Gilany score. Participants were assigned to receive either 200 mcg of chromium picolinate capsule or placebo daily for 12 weeks**. Results**: Chromium supplements in the intervention group viewed a statistically significant reduction in all glycemic control parameters, in contrast to the control group. There was a statistically significant reduction in fasting blood glucose after 1 month of intervention (P value < 0.05). **Conclusion:** Chromium supplement of 200 mcg has a statistically significant reduction in glycemic control and could improve glycemic control.

***Keywords*---**Diabetes mellitus, chromium, glycemic control, glycosylated hemoglobin.

Introduction

According to some accounts, "It is not just a health crisis; it is a global societal catastrophe," The primary factor contributing to the rising incidence of type 2 diabetes is its globalization. The number of persons with diabetes tripled from 108 million to 422 million between 1980 and 2014. An estimated 463 million people between the ages of 20 and 79 have diabetes. This represents 9.3% of the global population in this age group. There will be 578 million (10.2%) of them in total by 2030, and 700 million (10.9%) by 2045. An estimated 4.2 million individuals lost their lives to diabetes and its aftereffects in 2019 (1).

Egypt is currently ranked ninth out of ten countries in terms of the number of adults with diabetes; by 2045, it is expected to rise to number seven on the list, with the current number of 8.9 million (national prevalence 15.2%) expected to double to 16.9 million. The burden of diabetes presents difficulties for individuals with diabetes as well as for their families, communities, and healthcare systems. Indirect costs from lost productivity, early mortality, and a decline in a country's gross domestic product, as well as direct medical costs for diabetes prevention and treatment and its complications, can be used to characterize the financial burden on healthcare systems and the larger global economy. In Egypt, diabetes accounts for 7% of medical expenses (2).

Inadequately managed type 2 diabetes mellitus (T2DM) is the cause of a high rate of morbidity that significantly impairs quality of life and large annual costs, even with improvements in diagnostic and treatment techniques (3).

One kind of mineral is chromium (Cr). The term "essential trace element" refers to the fact that chromium is required in very tiny concentrations for human health. Chromium may be classified as either trivalent or hexavalent. The first one is safe for people and may be found in meals and supplements. A well-known toxin that may lead to lung cancer and skin issues is the second. Trivalent chromium in a physiologically active state was believed to be the ingredient that may reduce the plasma glucose levels of diabetic mice. Dyslipidemia, hyper-insulinemia, and

decreased glucose tolerance have all been linked to chromium deficiency. Additionally, the development of type 2 diabetes mellitus may be predicted by low blood chromium concentrations (4).

A current investigation is required to determine the impact of chromium supplements on the degree and parameters of diabetes, such as blood glucose and glycosylated hemoglobin (HbA1C), in diabetic patients who visit a family practice clinic.

Aim

This study aimed to determine the effect of chromium on glycemic control and to identify the reported side effects of chromium among patients with diabetes mellitus attending family medicine clinic, Suez Canal University hospitals, Egypt.

Patients and Methods

This double blinded randomized controlled clinical trial was carried out at the family medicine clinic affiliated to Suez Canal University hospitals; it is located in 4.5 km Ring road, Ismailia city, Egypt. The study setting provides comprehensive health care for wide range of patients with chronic diseases in Suez Canal area and Sinai districts. More than 360 patients attending the clinic monthly, according to outpatient registers.

Adult Patients diagnosed with diabetes mellitus who attended the Family medicine clinic at Suez Canal University hospitals (from to) and on current anti-hyperglycemic medications, of both genders with uncontrolled diabetic with HbA1c >7% or fasting blood glucose (FBG) >130mg/dl or PPG >180 mg/dl (according to glycemic targets in ADA 2021) despite the use of the prescribed medications were included in the study (5). While patients with target organ damage as evident by clinical, laboratory or imaging report- as such patients subjected to periodic assessment for target organ damage. For safety, patients known to be allergic to chromium, or patients with mental disorders that interfere with the adherence to the recommended interventions were excluded from the study.

Sample was selected by simple random sampling from list of patients with diabetes mellitus who matched the inclusion criteria attending family medicine clinic in Suez Canal University hospitals-using computer. Randomization was done by computerized table random generator. The sample patients was randomly allocated into two equal groups (intervention versus control) using table random generator. Blinding sides were participants and researcher. Drugs were identical in formulation, shape, size, weight, texture, and packing.

Intervention group were instructed to continue their management plan including lifestyle and anti-hyperglycemic agents along with receiving 200 mcg chromium capsule as intervention. According to the National Institute of Health (NIH), Office of Dietary Supplements, an adequate intake of Cr is about 25 to 30 mcg/day for daily requirements. Chromium chloride is the naturally occurring trivalent variety of chromium found in common food sources such as: whole grains, broccoli,

mushrooms and green beans. In contrast, Cr picolinate is the synthetic sibling of Cr chloride (6). Quantity: one capsules of Chromium (200 mcg of chromium picolinate contain about 25 mcg of elemental chromium) available in the market due to difficulty in obtaining the active substance from outside the country. Frequency: once/day after lunch, daily for 3 months.

Control group were instructed to continue their anti-hyperglycemic agents without changing dose throughout the study. Placebo capsule containing powder (natural polysaccharide, starch) looks like chromium capsules in color, smell, shape and size were taken at the same frequency as the chromium capsules. All participants were subjected to semi-structured interview using pre-designed questionnaires:

1-Socio-demographic data
A validated socio-demographic scale (Arabic version) was used. This scale includes 7 domains which are: cultural domain, education domain, family possessions domain, family domain, home sanitation domain, economic domain, and health care domain. The total score is 84, according to which the socioeconomic level was classified into very low, low, middle and high levels depending on the quartiles of the score calculated (7).
2-Disease related data: including history of D.M duration, complications and medications, other chronic diseases, or smoking.
3- Laboratory investigations: venous blood sample was collected from each participant in both groups to measure HbA1c and fasting blood sugar (FBS) and post prandial glucose (PPG) at the beginning of the study then after 3 months of intervention. FBG (after fasting for 8hours or more) and PPG were measured monthly to assess short term control. Samples were collected and analyzed at Suez Canal University hospital laboratory.
HbA1c was assessed by appropriate kits using COBAS 6000 for clinical chemistry by the Tina-quant® HbA1c assay; Roche Company. 2 ml of blood is needed. FBG and PPG was assessed by automatic biochemical analyzer.
Procedures: sample withdrawn was done under infection control measures. Gloves changed after contact with each patient. Masks and protective eyewear or face shields were worn during procedures that were likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes.
4-Monthly follow up schedule contains assessment of adherence, reported side effects, weight, and results of FBG, PPG.
Data collection & Follow up:

- Baseline data including information on socio-economic status, blood pressure, FBS, PPG and HbA1c was recorded prior to starting intervention and at the end of the study.
- Each participant was interviewed monthly to ensure adherence to treatment by capsule counting and to report any side effects.
- This was achieved through involvement of 94 patients; forty seven patients received chromium supplement (group A), while the other 47 received placebo (group B). Of the 94 patients, 7 patients dropped out (4 patients from intervention group and 3 from control group).

Data management and statistical analysis

- The obtained data was entered and analyzed using Statistical Package of Social Science (SPSS 20).
- Descriptive statistics were produced for socio-demographic variables were expressed in numbers and percentages.
- Comparison of the two groups using independent student's t test was done for continuous variables, while chi square test for categorical data.
- Comparison in between the same group before and after 3 months of intervention using dependent t test.
- The results were presented as tables and graphs.
- The results were statistically significant if P value <0.05.

Results

In this randomized controlled trial, the aim was to assess the effect of chromium supplement on glycemic control. This was achieved through enrollment of 94 patients; forty seven patients received chromium supplement (group A), while the other 47 received placebo (group B). Of the 94 patients, 7 patients dropped out (4 patients from intervention group and 3 from control group).

Table (1) illustrates the socio-economic features of each group. There is an obvious female predominance, with an average age of 51 among our participants. Both groups are relatively matched for sex and age with no statistically significant difference between them. Regarding occupation, about two thirds of patients are housewives (N.B: nearly two thirds of the study participants are females). While patients show a quite variability concerning their education, the majority of them are illiterate. Less than one fourth of the patients can only read and write.

When it comes to health care access, most of the patients in group A have more than one source of health care facilities (48.9%), while the majority of patients in group B depend on free governmental health services (36.2%). Almost all participants are barely able to meet routine expenses (47.9), while around one third of them are in debt. Concerning the crowding index, equal number of participants per group have similar crowding index. Lastly, greater number of participants have 5 or more family equipment (63.8%). Clearly, there is no statistically significant difference between both groups regarding any of the mentioned parameters.

Table 1: Comparison of personal and Socio-economic features between the intervention (A) & control group (B)

	Group A (Intervention) (N=47)	Group B (Control) (N=47)	Total (N=94)	P value
Gender				
▪ **Male**	15 (31.9)	16 (34)	31 (33)	0.5
▪ **Female**	32 (68.1)	31 (66)	63 (67)	
Age				
▪ **Mean ± SD**	52.1 ± 12.5	49.9 ± 13	51 ± 12.8	0.4
Occupation				
▪ **Housewife**	34 (72.3)	34 (72.3)	68 (72.3)	
▪ **Unskilled manual work**	5 (10.6)	3 (6.4)	8 (8.5)	0.8
▪ **Skilled manual work**	2 (4.3)	1 (2.1)	3 (3.2)	
▪ **Trades/business**	1 (2.1)	2 (4.3)	3 (3.2)	
▪ **Semiprofessional/clerk**	5 (10.6)	7 (14.9)	12 (12.8)	
▪ **Professional**	0 (0)	0 (0)	0 (0)	
Education				
▪ **Illiterate**	22 (46.8)	18 (38.3)	40 (42.6)	
▪ **Read and write**	9 (19.1)	10 (21.3)	19 (20.2)	
▪ **Primary**	4 (8.5)	8 (17)	12 (12.8)	
▪ **Preparatory**	0 (0)	0 (0)	0 (0)	
▪ **Secondary**	7 (14.9)	8 (17)	15 (16)	0.7
▪ **Intermediate (2 years)**	2 (4.3)	1 (2.1)	3 (3.2)	
▪ **Graduate**	3 (6.4)	2 (4.3)	5 (5.3)	
▪ **Postgraduate**	0 (0)	0 (0)	0 (0)	
Healthcare				
▪ **Traditional healer /self-care**	0 (0)	0 (0)	0 (0)	
▪ **More than one source**	23 (48.9)	13 (27.7)	36 (38.3)	
▪ **Free governmental health services**	12 (25.5)	17 (36.2)	29 (30.9)	0.2
▪ **Health insurance**	2 (4.3)	3 (6.4)	5 (5.3)	
▪ **Private health facilities**	10 (21.3)	14 (29.8)	24 (25.5)	
Economy				
▪ **In debt**	14 (29.8)	15 (31.9)	29 (30.9)	
▪ **Just meet routine expenses**	23 (48.9)	22 (46.8)	45 (47.9)	0.9
▪ **Meet routine expenses**	6 (12.8)	6 (12.8)	12 (12.8)	
▪ **Able to save/invest**	4 (8.5)	4 (8.5)	8 (8.5)	
Crowding Index				
▪ **≤ one person /room**	23 (48.9)	23 (48.9)	46 (48.9)	0.5
▪ **>one person /room**	24 (51.1)	24 (51.1)	48 (51.1)	
Family Equipment				
▪ **< 5 equipment**	16 (34)	18 (38.3)	34 (36.2)	0.4
▪ **≥ 5 equipment**	31 (66)	29 (61.7)	60 (63.8)	

Data are presented as number (%). Expressed percents are columnar percent. Chi square test was used. P value is significant < 0.05

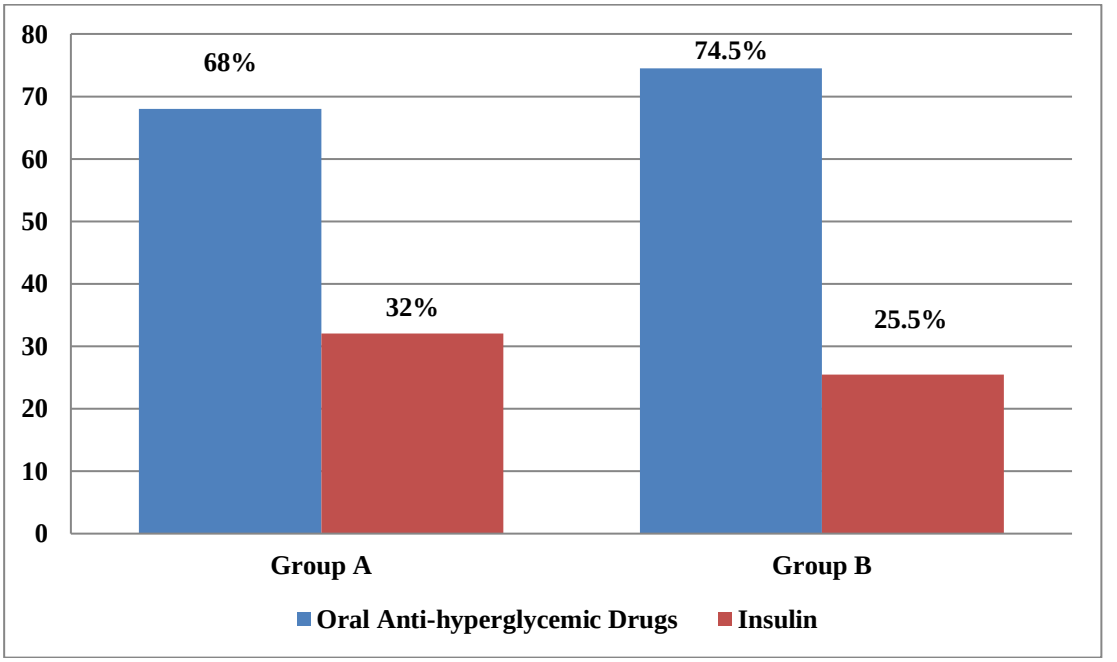

Figure 1: Types of anti-hyperglycemic drugs consumed by the intervention and control groups

Figure (1) demonstrates the different types of hypoglycemic drugs that are consumed by each group. Clearly, the majority of patients are consuming oral hypoglycemic drugs, while around 29% of them take insulin. Both groups follow the same pattern, with no statistically significant difference between both groups (p value 0.1).

Table (2) shows a comparison of glycemic control parameters between group A and B. There is four main important trends here. Firstly, all patients view a gradual decline in blood glucose level as indicated by FBG, 2hPPG and HbA1C during the follow up period. Secondly, no statistically significant difference in any of these parameters between both groups except for baseline FBG, FBG after 1 month and baseline HbA1C. Thirdly, all readings of group A tend to be higher than those of group B, except for FBG after 1 month, and 2hPPG after 1 month and after 2 months; however, these differences are not statistically significant. Lastly, all means of these readings are above the recommended levels by ADA. To summarize, by the end of the trial, no clinical or statistical significance difference is found between intervention and control groups

Table 2: Comparison of fasting and two hours post prandial blood glucose levels (FBG & 2HPPG), and hemoglobin A1C between the intervention (A) and control (B) groups

	Group A (Intervention) (N=47)	Group B (Control) (N=47)	Total (N=94)	P value
FBG				
▪ **Baseline**	249.9 ± 67.05	215.7 ± 64.2	232.8 ± 67.5	0.01*
▪ **1st Month**	244.7 ± 65.7	212.3 ± 59.3	228.5 ± 64.3	0.01*
▪ **2nd Month**	205.7 ± 76.2	204.2 ± 61.8	205 ± 69	0.9
▪ **3rd Month**	195.6 ± 77.8	197.3 ± 75.6	196.5 ± 76.3	0.9
2hPPG				
▪ **Baseline**	311.1 ± 78.3	285.6 ± 87.1	298.3 ± 83.4	0.1
▪ **1st Month**	300.6 ± 76.8	284.45 ± 85.2	292.5 ± 81.1	0.3
▪ **2nd Month**	263 ± 100	277.2 ± 90.7	270.1 ± 95.2	0.4
▪ **3rd Month**	252.2 ± 105.7	263. 6 ± 105.4	257.9 ± 105.1	0.6
HbA1C				
▪ **Baseline**	10.2 ± 2.2	9.05±1.916	9.6 ± 2.1	0.008*
▪ **3rd Month**	9 ± 3.4	8.4 ± 2.8	8.7 ± 3.1	0.3

Data are presented as mean ± SD. FBG: fasting blood glucose; 2hPPG: two hours post-prandial glucose; HbA1C: hemoglobin A1C.Independent T test was used. P value is significant < 0.05.

Table (3) illustrates a comparison between group A and group B regarding the mean difference in all outcome measures. The magnitude of mean difference with group A is higher than in group B; however, this difference is statistically significant with FBG readings only.

Table 3: Comparison of mean difference of outcome measures at baseline and final follow up visit between intervention group (A) & control group (B)

	Group A (Intervention) (N=47)	Group B (Control) (N=47)	P value
FBG	54.3 ± 77.4	18.3 ± 77.1	0.02*
2H PPG	58.8 ± 92.6	21.9 ± 94.1	0.05
HbA1C	1.1 ± 3	0.5 ± 2.8	0.3

Data are presented as mean ± SD. Independent T test was used. P value is significant < 0.05

Table (4) illustrates a comparison between group A and group B regarding side effects of chromium supplement. Overall, the incidence of side effects does not exceed 22.5% during any visit. It is noted that the incidence of side effects was comparable between both study groups with no statistically significant difference.

It is worthy to mention that a higher incidence of side effects is noted among group B during all visits except for the second month visit.

Table 4: Comparison of reported side effects between the intervention and control groups

	Group A (Intervention) (N=47)	Group B (Control) (N=47)	Total (N=94)
1st Month			
No	42 (89.3)	38 (80.8)	80 (85.2)
Yes	5 (10.7)	9 (19.2)	14 (14.8)
2nd Month			
No	36 (76.6)	41 (87.2)	77 (81.9)
Yes	8 (17.0)	5 (10.7)	13 (13.9)
3rd Month			
No	35 (74.5)	31 (66)	66 (70.2)
Yes	8 (17)	13 (27.6)	21 (22.5)

Data are presented as number (%). Expressed percents are columnar percent. Chi square test was used.

Table (5) shows that during the first month visit, the most common side effects are gastro-intestinal tract (GIT) upset and dizziness followed by headache. While during the second month visit, headache is the most prevalent followed by GIT upset, then dizziness. During the final visit, the most common side effect is GIT upset followed by headache, then dizziness then fatigue.

Table 5: Different reported side effects between the intervention and control group

	Group A (Intervention) (N=47)	Group B (Control) (N=47)	Total (N=94)	P value
1st Month				
Headache	2 (4.3)	2 (4.3)	4 (4.2)	
GIT upset	3 (6.4)	2 (4.3)	5 (5.3)	0.1
Dizziness	0 (0)	5 (10.6)	5 (5.3)	
Fatigue	0 (0)	0 (0)	0 (0)	
2nd Month				
Headache	5 (10.6)	1 (2.1)	6 (6.4)	0.1
GIT upset	3 (6.4)	2 (4.3)	5 (5.3)	
Dizziness	0 (0)	2 (4.3)	2 (2.1)	
Fatigue	0 (0)	0 (0)	0 (0)	
3rd Month				
Headache	3 (6.4)	2 (4.3)	5 (5.3)	0.1

	Group A (Intervention) (N=47)	Group B (Control) (N=47)	Total (N=94)	P value
GIT upset	5 (10.6)	4 (8.5)	9 (9.6)	
Dizziness	0 (0)	4 (8.5)	4 (4.2)	
Fatigue	0 (0)	3 (6.4)	3 (3.2)	

Data are presented as number (%). Expressed percents are columnar percent. Chi square test was used. P value is significant < 0.05.

Table (6) expresses the levels of adherence of both groups. The majority of patients show a low to medium adherence. Overall, few patients express high adherence (not more than 16%); however, high adherence level is more prevalent within group A during all visits. This difference is statistically significant during the last visit only. It is obvious that adherence is diminishing during the follow up visits. It is worthy to mention that there is 7 patients dropped out during follow up visits; 4 of them during the second month visit, and 3 more by the final visit.

Discussion

Few studies have been conducted globally on the function of chromium in glycemic control. Research on this impact on Egyptian patients is also lacking. Therefore, the purpose of this study was to evaluate its impact on diabetes management measures. Additionally, the safety of chromium was assessed. 94 individuals who were already taking their regular hypoglycemic medications were involved in the trial; half of them started taking a chromium supplement, while the other half got a placebo. Over the course of the three-month trial, FBG, and 2hPPG, were all monitored at monthly follow-up visits. After three months, the HbA1C was tested. The research also determined the degree of adherence and the frequency of adverse effects. The patients' sociodemographic and personal characteristics were matched.

Here is a discussion of the study's results in light of recent research. In comparison to a placebo, 200 mg of chromium picolinate generally improved glycemic control. In particular, patients' FBG, 2HPPG, and HbA1C levels significantly decreased. The research on the impact of chromium on FBG, 2hPPG, and HbA1C was wildly inconsistent. Some investigations supported the results, such as a study (8), who discovered that after three months, the administration of a chromium supplement dramatically reduced FBG.

Additionally, meta-analysis (9) revealed that chromium supplementation, in varying forms and dosages, might raise FBG but not HbA1C. Following hard data showing a decrease in FBG and HbA1C, a more recent meta-analysis by a study (10) supported the use of chromium for glycemic management. Oddly, a meta-analysis from 2022a found that chromium supplements enhanced HbA1C levels but not FBG (11).

The idea that chromium functions at the cellular level in glycemic regulation may help to explain the partial concordance between the findings of the present investigation and the studies listed above. This mechanism won't vary from one research to the next.

In contrast, another study (12) showed no statistically significant decrease in FBG after two months of 400 mcg of chromium vs a placebo. The authors also suggested that more homogeneous research be done, even if certain meta-analysis studies failed to provide a firm conclusion about the effectiveness of chromium for glycemic management due to the discovery of a small impact.

One possible explanation for the partial disparity between the present study's findings and those of the aforementioned research is the use of varying intervention durations. The present research found that 200 mcg of chromium was enough for improvement alone, but not for attaining complete control, which is the recommended dosage for best glycemic control. This is because, while not to normal levels, FBG dropped from 249.9 to 195.6 mg/dL, 2hPPG from 311.1 to 252.2 mg/dL, and HbA1C from 10.2 to 9%. To accomplish it, a larger dosage was most likely required.

This is supported by a research (8) who observed a significant drop in FBG levels to normal levels (129.9 to 119.9 mg/dL) after administering 400 mcg of chromium. This is further corroborated by a meta-analysis, which found that most of the trials used 400 mcg or greater doses of chromium (13).

Although it is evident that chromium is present in human tissues and diet, there is insufficient data to determine its quantity or insufficiency. Therefore, it is believed that those who are most in need of chromium supplements may profit from them the most (4).

Although chromium picolinate was used in this research, other varieties, including chromium yeast, Brewer's yeast, chromium chloride, nicotinate, propionate, and histidinate, were employed in other investigations. Since chromium picolinate was the most often utilized kind in these investigations, it did not also demonstrate a clinically meaningful benefit (14).

Numerous investigations examined the function of chromium and contrasted various sorts and dosages as well as therapy durations. To investigate the impact of these factors on chromium's effectiveness in controlling diabetes, for example, Yin and Phung performed a meta-analysis. Regretfully, they discovered no dosage or kind of advantage on HBA1C. They discovered, however, that only brewer's yeast had a negligible impact on FBG. Despite being a comprehensive meta-analysis, this study's data is insufficient to support generalization. This is due to the fact that the features of the study participants were quite diverse. The inclusion criteria are yet another element that contributes to this disparity in the outcomes. It is true that include high-risk populations makes glycemic management more difficult (15).

In terms of chromium safety, the present research discovered a negligible number of adverse effects that seemed to be unrelated to the chromium supplement itself, since the control group had similar side effects. There was no difference between the two groups that was statistically significant. According to another study (16), there are very few adverse effects of chromium, including headache, lightheadedness, nausea, and vomiting. Its usage as a safe supplement is supported by several research.

However, a small number of studies made serious adverse effect claims with little supporting data. For example, higher dosages of chromium supplements may harm DNA (17). Because it was only based on a cell culture investigation, this data is poor. Khodavirdipour addressed this viewpoint, and in vitro research is advised to support this assertion.

A few isolated investigations from decades before documented kidney damage after chromium supplementation, but no clear link was discovered. Chromium in its inorganic state is also poorly absorbed and may be hazardous (18). In conclusion, more reliable and robust research, including many clinical trials conducted over extended periods of time, has validated the safety of chromium, even at larger dosages (1000 mcg daily).

Given the following research limitations, the findings of this study cannot be extrapolated or applied to the practice populations of diabetes patients. Unlike other research that evaluated only one glycemic control indicator, the present study analyzed FBG, 2HPPG, and HbA1C. However, there were certain restrictions; the amount of chromium picolinate utilized was just 200 mcg. Better results were associated with higher chromium dosages. The impact of the minimal dosage on glycemic control was examined in this research with a dose of only 200 mcg. The minimal follow-up duration was also selected. Additionally, chromium picolinate's market availability supported the decision to use it in this investigation rather from alternative forms that were better.

Conclusion

Chromium supplement of 200 mcg has a statistically significant reduction in glycemic control and could improve glycemic control in a short duration of three months, with fewer side effects, most commonly GIT upset, Headache, dizziness and fatigue.

References

1. Donaghue KC, Marcovecchio ML, Wadwa RP, Chew EY, Wong TY, Calliari LE, et al. ISPAD Clinical Practice Consensus Guidelines 2018: Microvascular and macrovascular complications in children and adolescents. Pediatr Diabetes [Internet]. 2018 Oct;19 Suppl 2(Suppl 27):262–74. Available from: https://pubmed.ncbi.nlm.nih.gov/30079595
2. de Boer IH, Bangalore S, Benetos A, Davis AM, Michos ED, Muntner P, et al. Diabetes and Hypertension: A Position Statement by the American Diabetes Association. Diabetes Care [Internet]. 2017;40(9):1273–84. Available from: http://dx.doi.org/10.2337/dci17-0026
3. Group IDFDA. Update of mortality attributable to diabetes for the IDF Diabetes Atlas: Estimates for the year 2013. Diabetes Res Clin Pract [Internet]. 2015;109(3):461–5. Available from: http://dx.doi.org/10.1016/j.diabres.2015.05.037
4. Willis M, Asseburg C, Neslusan C. Conducting and interpreting results of network meta-analyses in type 2 diabetes mellitus: A review of network meta-analyses that include sodium glucose co-transporter 2 inhibitors. Diabetes Res Clin Pract [Internet]. 2019;148:222–33. Available from:

http://dx.doi.org/10.1016/j.diabres.2019.01.005
5. Association AD. 11. Microvascular complications and foot care: standards of medical care in diabetes− 2020. Diabetes Care. 2020;43(Supplement_1):S135–51.
6. Health NI of. Office of Dietary Supplements. Dietary supplement fact sheet. Availabe online https//ods od nih gov/factsheets/(accessed 25 April 2021). 2006;
7. El-Gilany A, El-Wehady A, El-Wasify M. Updating and validation of the socioeconomic status scale for health research in Egypt. East Mediterr Heal J [Internet]. 2012;18(9):962–8. Available from: http://dx.doi.org/10.26719/2012.18.9.962
8. Farrokhian A, Mahmoodian M, Bahmani F, Amirani E, Shafabakhsh R, Asemi Z. The Influences of Chromium Supplementation on Metabolic Status in Patients with Type 2 Diabetes Mellitus and Coronary Heart Disease. Biol Trace Elem Res [Internet]. 2019;194(2):313–20. Available from: http://dx.doi.org/10.1007/s12011-019-01783-7
9. Maret W. 9. CHROMIUM SUPPLEMENTATION IN HUMAN HEALTH, METABOLIC SYNDROME, AND DIABETES [Internet]. Essential Metals in Medicine: Therapeutic Use and Toxicity of Metal Ions in the Clinic. De Gruyter; 2019. p. 231–52. Available from: http://dx.doi.org/10.1515/9783110527872-009
10. Asbaghi O, Fatemeh N, Mahnaz RK, Ehsan G, Elham E, Behzad N, et al. Effects of chromium supplementation on glycemic control in patients with type 2 diabetes: a systematic review and meta-analysis of randomized controlled trials. Pharmacol Res [Internet]. 2020;161:105098. Available from: http://dx.doi.org/10.1016/j.phrs.2020.105098
11. Zhao M, Ge X, Xu J, Li A, Mei Y, Zhao J, et al. Negatively interactive effect of chromium and cadmium on obesity: Evidence from adults living near ferrochromium factory. Ecotoxicol Environ Saf [Internet]. 2022;231:113196. Available from: http://dx.doi.org/10.1016/j.ecoenv.2022.113196
12. Talab AT, Abdollahzad H, Nachvak SM, Pasdar Y, Eghtesadi S, Izadi A, et al. Effects of Chromium Picolinate Supplementation on Cardiometabolic Biomarkers in Patients with Type 2 Diabetes Mellitus: a Randomized Clinical Trial. Clin Nutr Res [Internet]. 2020 Apr 24;9(2):97–106. Available from: https://pubmed.ncbi.nlm.nih.gov/32395440
13. Zhao F, Pan D, Wang N, Xia H, Zhang H, Wang S, et al. Effect of Chromium Supplementation on Blood Glucose and Lipid Levels in Patients with Type 2 Diabetes Mellitus: a Systematic Review and Meta-analysis. Biol Trace Elem Res [Internet]. 2021;200(2):516–25. Available from: http://dx.doi.org/10.1007/s12011-021-02693-3
14. Brownley KA, Boettiger CA, Young L, Cefalu WT. Dietary chromium supplementation for targeted treatment of diabetes patients with comorbid depression and binge eating. Med Hypotheses [Internet]. 2015/03/27. 2015 Jul;85(1):45–8. Available from: https://pubmed.ncbi.nlm.nih.gov/25838140
15. Yin R V, Phung OJ. Effect of chromium supplementation on glycated hemoglobin and fasting plasma glucose in patients with diabetes mellitus. Nutr J [Internet]. 2015 Feb 13;14:14. Available from: https://pubmed.ncbi.nlm.nih.gov/25971249
16. Hamilton EM, Young SD, Bailey EH, Watts MJ. Chromium speciation in foodstuffs: A review. Food Chem [Internet]. 2018;250:105–12. Available from:

http://dx.doi.org/10.1016/j.foodchem.2018.01.016
17. Khodavirdipour A, Haddadi F, Keshavarzi S. Chromium Supplementation; Negotiation with Diabetes Mellitus, Hyperlipidemia and Depression. J Diabetes Metab Disord [Internet]. 2020 Mar 5;19(1):585–95. Available from: https://pubmed.ncbi.nlm.nih.gov/32550211
18. Jeejeebhoy KN. The Role of Chromium in Nutrition and Therapeutics and As a Potential Toxin. Nutr Rev [Internet]. 2009;57(11):329–35. Available from: http://dx.doi.org/10.1111/j.1753-4887.1999.tb06909.x