Esercizi

Test d’ipotesi su medie (var note e non note)

20/11/20

Esercizio 1

Sono stati campionati 25 bambini i cui genitori sono affetti da diabete di tipo II e 25 i cui genitori non sono affetti da diabete. I primi presentavano un livello medio di glicemia a digiuno pari a 86.1 mg/dl, mentre gli altri pari a 82.2 mg/dl. È noto che le ds delle due popolazioni sono pari a 2.09 e 2.49

Verificare se la malattia dei genitori modifica il livello medio di glicemia dei bambini (α=0.05)

Risposta

$$\begin{cases} H_0 : \mu_1 = \mu_2 \\ H_1 : \mu_1 \neq \mu_2 \end{cases}$$

$$\mathbf{z = \frac{86.1 - 82.2}{\sqrt{\frac{2.09^2}{25} + \frac{2.49^2}{25}}} = \frac{3.9}{\frac{1}{5}\sqrt{4.3681 + 6.2001}} =}$$

$$\mathbf{= \frac{3.9}{\frac{1}{5}\sqrt{10.5682}} = \frac{3.9}{\frac{3.251}{5}} = \frac{3.9}{0.650} = 6}$$

Il valore di z osservato è di molto superiore al valore soglia pari a 1.96, pertanto posso rifiutare $H_{0.}$ Il livello di glicemia è diverso bambini i cui genitori sono affetti da diabete di tipo II rispetto agli altri.

Il p-value del test è P<0.00001

La stima della differenza di glicemia è 3.9 mg/dl [95%IC: 3.9±1.97 ·0.65 = 2.62-5.18]

Esercizio 2

- In un test sull'efficacia dell'aglio per abbassare il colesterolo, 49 soggetti sono stati «trattati» con aglio crudo. I livelli di colesterolo sono stati misurati prima e dopo il trattamento. I cambiamenti (prima meno dopo) nei loro livelli di colesterolo a bassa densità di lipoproteine (LDL) (in mg/dL) hanno una media di 0,4 e una deviazione standard di 19,3 (basata sui dati di “Effect of Raw Garlic vs Commercial Garlic Supplements on Plasma Lipid Concentrations in Adults with Moderate Hypercholesterolemia,” by Gardner et al., Archives of Internal Medicine, Vol. 167, No. 4).
- Utilizzare un livello di significatività pari a 0.05 per verificare l'affermazione che con il trattamento con aglio, il cambiamento medio nel colesterolo LDL sia maggiore di 0. Cosa suggeriscono i risultati sull'efficacia del trattamento con l'aglio?

Effect of raw garlic vs commercial garlic supplements on plasma lipid concentrations in adults with moderate hypercholesterolemia: a randomized clinical trial.

Gardner CD1, Lawson LD, Block E, Chatterjee LM, Kiazand A, Balise RR, Kraemer HC.
Author information

BACKGROUND:
Garlic is widely promoted as a cholesterol-lowering agent, but efficacy studies have produced conflicting results. Garlic supplements differ in bioavailability of key phytochemicals. We evaluated the effect of raw garlic and 2 commonly used garlic supplements on cholesterol concentrations in adults with moderate hypercholesterolemia.
METHODS:
In this parallel-design trial, 192 adults with low-density lipoprotein cholesterol (LDL-C) concentrations of 130 to 190 mg/dL (3.36-4.91 mmol/L) were randomly assigned to 1 of the following 4 treatment arms: raw garlic, powdered garlic supplement, aged garlic extract supplement, or placebo. Garlic product doses equivalent to an average-sized garlic clove were consumed 6 d/wk for 6 months. The primary study outcome was LDL-C concentration. Fasting plasma lipid concentrations were assessed monthly. Extensive chemical characterization of study materials was conducted throughout the trial.
RESULTS:
Retention was 87% to 90% in all 4 treatment arms, and chemical stability of study materials was high throughout the trial. There were no statistically significant effects of the 3 forms of garlic on LDL-C concentrations. The 6-month mean (SD) changes in LDL-C concentrations were +0.4 (19.3) mg/dL (+0.01 [0.50] mmol/L), +3.2 (17.2) mg/dL (+0.08 [0.44] mmol/L), +0.2 (17.8) mg/dL (+0.005 [0.46] mmol/L), and -3.9 (16.5) mg/dL (-0.10 [0.43] mmol/L) for raw garlic, powdered supplement, aged extract supplement, and placebo, respectively. There were no statistically significant effects on high-density lipoprotein cholesterol, triglyceride levels, or total cholesterol-high-density lipoprotein cholesterol ratio.
CONCLUSIONS:
None of the forms of garlic used in this study, including raw garlic, when given at an approximate dose of a 4-g clove per day, 6 d/wk for 6 months, had statistically or clinically significant effects on LDL-C or other plasma lipid concentrations in adults with moderate hypercholesterolemia.
TRIAL REGISTRATION:ClinicalTrials.gov NCT00056511.

H_0: $\delta = 0$
H_1: $\delta > 0$
$\alpha = 0.05$

$t_{gdl=48,0.95} = 1.684$

$$t = \frac{0.4-0}{19.3/\sqrt{49}} = 0.145$$

Non rigettiamo H_0.

P-value > 0.25

$$IC90\%: \ 0.4 \pm 1.684\frac{19.3}{\sqrt{49}} \ \rightarrow [-4.24; 5.04]$$

Esercizio 3: Magnet Treatment of Pain

Le persone spendono circa $ 5 miliardi all'anno per l'acquisto di magneti usati per trattare una vasta gamma di dolori. I ricercatori hanno condotto uno studio per determinare se i magneti sono efficaci nel trattamento del mal di schiena. Il dolore è stato misurato usando la scala analogica visiva, i risultati riportati di seguito sono tra i risultati ottenuti nello studio ("Bipolar Permanent Magnets for the Treatment of Chronic Lower Back Pain: A Pilot Study," by Collacott, Zimmerman, White, and Rindone, Journal of the American Medical Association, Vol. 283, No. 10).

a. Utilizzare un livello di significatività 0.01 per verificare l'affermazione secondo cui i pazienti trattati con i magneti hanno una diversa riduzione del dolore rispetto a quelli trattati con un trattamento «placebo».

b. Costruire l'intervallo di confidenza appropriato per il test di ipotesi nella parte (a).

c. Sembra che i magneti siano efficaci nel trattamento del mal di schiena?

Riduzione di dolore dopo trattamento con mageti: n = 20, $\bar{x}$ = 0.49, s = 0.96

Riduzione di dolore dopo placebo: n = 20, $\bar{x}$ = 0.44, s = 1.4

JAMA. 2000 Mar 8;283(10):1322-5.

Bipolar permanent magnets for the treatment of chronic low back pain: a pilot study.

Collacott EA[1], Zimmerman JT, White DW, Rindone JP.

Abstract

CONTEXT:
Chronic low back pain is one of the most prevalent and costly medical conditions in the United States. Permanent magnets have become a popular treatment for various musculoskeletal conditions, including low back pain, despite little scientific support for therapeutic benefit.

OBJECTIVE:
To compare the effectiveness of 1 type of therapeutic magnet, a bipolar permanent magnet, with a matching placebo device for patients with chronic low back pain.

DESIGN:
Randomized, double-blind, placebo-controlled, crossover pilot study conducted from February 1998 to May 1999.

SETTING:
An ambulatory care physical medicine and rehabilitation clinic at a Veterans Affairs hospital.

PATIENTS:
Nineteen men and 1 woman with stable low back pain of a mean of 19 years' duration, with no past use of magnet therapy for low back pain. Twenty patients were determined to provide 80% power in the study at P<.05 to detect a difference of 2 points (the difference believed to be clinically significant) on a visual analog scale (VAS).

INTERVENTIONS:
For each patient, real and sham bipolar permanent magnets were applied, on alternate weeks, for 6 hours per day, 3 days per week for 1 week, with a 1-week washout period between the 2 treatment weeks.

MAIN OUTCOME MEASURES:
Pretreatment and posttreatment pain intensity on a VAS; sensory and affective components of pain on the Pain Rating Index (PRI) of the McGill Pain Questionnaire; and range of motion (ROM) measurements of the lumbosacral spine, compared by real vs sham treatment.

RESULTS:
Mean VAS scores declined by 0.49 (SD, 0.96) points for real magnet treatment and by 0.44 (SD, 1.4) points for sham treatment (P = .90). No statistically significant differences were noted in the effect between real and sham magnets with any of the other outcome measures (ROM, P = .66; PRI, P = .55).

CONCLUSIONS:
Application of 1 variety of permanent magnet had no effect on our small group of subjects with chronic low back pain.

H_0: $\mu_1 = \mu_2$
H_1: $\mu_1 \neq \mu_2$
$\alpha = 0.01$

g.d.l.=20+20-2=38
Valore critico 2.704

$$s^2 = \frac{(20-1) * 0.96^2 + (20-1) * 1.4^2}{(20-1) + (20-1)} = 1.4408 \qquad s = \sqrt{1.4408} = 1.2$$

$$t = \frac{0.49 - 0.44}{\sqrt{1.4408 * \left(\frac{1}{20} + \frac{1}{20}\right)}} = \frac{0.05}{0.3796} = 0.1317$$

Non possiamo rigettare H_0 : la riduzione di dolore non è differente nei due gruppi

P-value~0.44828*2=0.8966

$$IC99\%: [-0.976; 1.076]$$