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Effectiveness of Dark Chocolate and Carrot Juice on Perceived Labor Pain During Stage 1 of Birth Delivery Among Primigravida: A Quasi-Experimental Study

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ABSTRACT

Background: Dark chocolate and carrot juice may positively decline the pain. However, there is a lack evidence the impact of combination dark chocolate and carrot juice on labor pain during stage 1 of birth delivery among primigravida. **Objective:** This study aimed to examine the effectiveness of dark chocolate and carrot juice on perceived labor pain during stage 1 of birth delivery among primigravida. **Methods:** This was a quasi-experimental study with participants who received dark chocolate (n=30), carrot juice (n=30), and control group (n=30). Pain level was assessed by using the Numeric Pain Rating Scale (NPRS) before the intervention and at 30 hours after intervention. The Chi-square and one-way analysis of variance tests and general equational model were used. **Results:** Data were collected and analyzed before and after 60 minutes of intervention. Our results showed a significant interaction between the group and time, with both groups independently ameliorating labor pain. **Conclusion:** Dark chocolate and carrot juice therapies independently lowered pain labor in primigravida mothers, making them a viable treatment for advanced pain labor.

Keywords: Birth delivery; carrot Juice; dark chocolate; labor pain.

1. BACKGROUND

Labor pain is consistently one of the most excruciating pains (1), resulting in multidimensional physiological experiences with psychological, emotional, and spiritual health (2, 3). The inability to control the pain of labor would therefore lead to increased levels of stress, which would severely impact the health of the mother, the fetus, and the baby (4). Mechanically, pain stimulates oxygen consumption and hyperventilation. Thus, it should cause pulmonary alkalosis and decline the amount of blood delivered to the fetus (4). Pain management in labor was approached through pharmaceutical treatments. Nevertheless, due to the adverse effects on the mother and fetus, non-pharmacological pain treatments are getting more popular (5). Midwives are responsible for the development and implementation of nonpharmacologic strategies to reduce labor pain in pregnant women and raise labor comfort levels (6). Currently, wide non-pharmaceutical treatments exist for declining labor pain (7). However, lack of study to investigated the effect of non-pharmaceutical treatments on pain at the first stage of labor (8).

Dark chocolate, for a vast array of therapeutic purposes, such as analgesia or pain treatment, by both ancient societies and modern medicine, lends credence to the possibility that dark chocolate has beneficial health effects (9). Chocolate's hedonic sensory appeal likely triggers endorphin and cortisol production, like other pleasant-tasting or "loved" meals (10). A previous experimental study revealed that dark chocolate was significantly decline menstrual pain (11). Nonetheless, no research has been conducted to explore the effect of dark chocolate on pain at the first stage of labor. Consequently,

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the effect of dark chocolate on pain at the first stage of labor need to be explored.

Carrots are an appropriate whole food to target in the context of human study since they are easily created into a daily diet, widely consumed and budget-friendly (12). Remarkably, carrot juice with carotenoids and phenolics compounds may escalate the antioxidant activity (13). A randomized clinical trial among labor women suggested that who had consumption phenolics significantly decreased pain intensity (14). Several studies have investigated the effect of carrot juice on declining severe pain in menstruation (15, 16), but no of study to investigate the effect of carrot juice on pain at the first stage of labor.

2. OBJECTIVE

This investigation aimed to compare the effects of dark chocolate and carrot juice treatments on declining the labor pain of primigravida women. Thus, to provide advice in the event that these nutrients reduced labor pain.

3. MATERIAL AND METHODS

Study design and setting

This quasi-experimental study was conducted from August to December 2021 at seven health care centers "Polindes" services with managed by physician and midwives in Langsa district, Aceh Province. Ethics approval number from Committee Board of Universitas Sumatera Utara, Indonesia (IRB number: 2311/VI/SP/2021) and was in authority with the Declaration of Helsinki's principles.

Participants

Convenience sampling was used to recruit participants with primigravida women as the target population. A quasi-experimental study included arm three groups (dark chocolate, carrot juice, and control group). Inclusion criteria for primigravida women participants included those who agreed to participate, term pregnancy 37-42 weeks, prevaginal delivery, pregnancy prosses without complication, and cervical dilatation 2 to 3 cm to identify the starting point for each participant in the investigation. Likewise, participants who confirmed eclampsia or other chronic illness, analgesic drugs use, had allergy to dark chocolate and carrot juice history and cervical dilatation \leq 4 cm were excluded from the study.

Sample size

To estimate the sample size for the repeated-measures analysis of variance, a power was carried out using G*Power Version 3.1.2, with the power sample set at 0.95, the effect size established at 0.50 (17), and the significance level set at 5% for three groups. Following these estimates, the sample size was estimated to be 66 patients, with 23 in each group. The study used a dropout rate of 35%, which mean that 30 people were selected for each group (1:1:1 group allocation ratio), thus this study included total 90 participants.

Intervention

Dark chocolate group

During the first stage of the latent phase (cervical opening 2-3 cm), 100 grams of powdered dark chocolate produced from cocoa beans from Aceh Providence, Indonesia and commercialized with certified by food regulation of Indonesian government. The enumerator prepared the dark chocolate drink by dissolving it in 200 ml of warm water without sugar, and the respondent was encouraged to drink it within 5-10 minutes.

Carrot juice group

The enumerator prepared fresh 250 grams of organic carrot processed by mixed with 200 ml of mineral water without sugar to the respondent for one drink at the initial stage of the latent phase (cervical opening 2-3 cm) and consumed within 10 minutes.

Control group

Both the control group and the intervention group received standard midwifery care. The researcher accompanied the mother intermittently, inspected the cervix, measured the fetal heart rate, assessed the mother's vital signs, and determined whether the amniotic sac was ruptured. In addition, the researcher provided mothers in the control group with 200 ml of mineral water. There was no utilization of pharmaceutical medications. Non-pharmacological techniques such as massage, acupuncture, hypnotherapy, and music were not utilized.

Assessments

Before intervention treatment, participants answered questions about their labor pain (baseline; T0). All surveys were collected face-to-face, filled out by participants in the presence of their families, and confirmed using the participants' medical data. Following the intervention, each group received regular midwifery care. Participants in the intervention group were given dark chocolate or carrot juice. The control group will be assigned mineral water and will complete a questionnaire. All participants performed the before intervention (T0) and 30-minute after intervention (T1) follow-up labor pain assessment after the intervention.

Demographic characteristics

Data demographic characteristics including age, gestational age, cervical dilatation, employment status (unemployed, employed), education level (international standard classification of education; ISCED <3, ISCED 3), income (low, high income), and prenatal education (yes, no) were collected from the participants (Table 1).

Pain assessment

The Numeric Pain Rating Scale (NPRS) was utilized to evaluate labor pain levels. On this scale, individuals should rank their pain from 0 (no pain) to 10 (extreme agony) (unbearable pain). In previous investigations (18, 19), the validity and reliability of the numerical pain rating scale were evaluated and confirmed among women with labor pain. Moreover, the Cronbach's α values for the NPRS Indonesian version was 0.754 (20), and in our study was 0.821.

Data analysis

For statistical analysis, SPSS 25.0 (Chicago, IL, USA) was utilized, and a p-value of 0.05 was considered statistically significant. The mean (standard deviation; SD)

and n (percent) were performed, respectively, to identify continuous and categorical data. The Chi-square and one-way analysis of variance (ANOVA) tests compared the four groups' sociodemographic and baseline characteristics, respectively. Adjustments were made for potential confounding variables utilizing generalized estimating equation models (GEE) with appropriate link functions and distribution assumptions to assess differential changes in outcomes over time and between groups.

4. RESULTS

Overall, 90 individuals with T2DM were randomized to dark chocolate treatments (n = 30), carrot juice intervention (n = 30), and control group intervention (n = 30). The overall compliance of patients to the both interventions was optimal. No

Characteristic	Control group (n=30), n (%)	Carrot juice Intervention (n=30), n (%)	Dark Chocolate Intervention (n=30), n (%)	P value a
Age (years), (mean, SD)	24.53 (2.70)	26.23 (3.16)	26.23 (3.16)	0.077 b
Gestational age (weeks), (mean, SD)	38.27 (1.87)	38.20 (1.16)	38.33 (1.88)	0.953 b
Cervical dilatation	2.87 (0.35)	2.87 (0.36)	2.73 (0.45)	0.304 b
Education				
ISCED < 3	8 (26.7)	5 (16.7)	8 (26.7)	0.572
ISCED ³	22 (73.3)	25 (83.3)	22 (73.3)	
Employment status				
Unemployed	10 (33.3)	12 (40.0)	15 (50.0)	0.418
Employed	20 (66.7)	18 (60.0)	15 (50.0)	
Income (IDR)				
Low income	16 (53.3)	18 (60.0)	15 (50.0)	0.731
High income	14 (46.7)	12 (40.0)	15 (50.0)	
Prenatal education				
No	9 (30.0)	11 (36.7)	4 (13.3)	0.109
Yes	21 (70.0)	19 (63.3)	26 (86.7)	
Labor pain (mean, SD)	4.73 (0.58)	5.03 (0.67)	5.00 (0.70)	0.153

Table 1. Comparisons of participants' sociodemographic and clinical data according to group (n=90). Note: n: number, SD: standard deviation, IDR: Indonesian rupiah rate, ISCED: international standard classification of education. Data are presented as the mean ± standard deviation (SD) or frequency (n) and percentage (%). aChi-square statistics, with p-value. b Analysis of variance, with p-value. p<0.05 indicates statistical significance

Control Group (n = 30), Mean (SD)			Carrot juice Group (n = 30), mean (SD)			Dark chocolate (n = 30), Mean (SD)		
Baseline	30 min	Diff (95% CI), p Value	Baseline	30 min	Diff (95% CI), p Value	Baseline	30 min	Diff (95% CI), p Value
4.73 (0.58)	5.50 (0.51)	-0.77 (-1.056~-0.478)**	5.03 (0.67)	3.60 (0.72)	1.43 (1.245~1.622)**	5.00 (0.70)	2.87 (0.43)	2.13 (1.827~2.439)**

Table 2. Pain labor score before and after the intervention in participants (n = 90). Note: n: number, SD: standard deviation, Diff: difference between after and before, CI: confidence interval. Paired sample T-test for differences (95% CI), with * p < 0.05; ** p < 0.001.

Within-Time Ref: Baseline β (95% CI), p Value	Between Group		Interaction Group (Carrot juice) × Time, Ref: (Control group) × Time β (95% CI), p Value	Interaction Group (Dark chocolate) × Time, Ref: (Control group) × Time β (95% CI), p Value
	Carrot juice vs. Control group β (95% CI), p Value	Dark chocolate vs. Control group β (95% CI), p Value		
-0.400 (-0.505~-0.295) **	0.300 (-0.012~0.612)	0.267 (-0.053~0.586)	-2.200 (-2.252~-1.875) **	-2.900 (-3.297~-2.503) **

Table 3. Evaluation of the intervention on the pain labor in participants based on general estimating equation analyse (n = 90). Note: n: number of participants, β: regression coefficient, CI: confidence interval. β values and 95% CIs were estimated using generalized estimating equations with * p < 0.05; ** p < 0.001.

statistically significant differences were noted in socio-demographic or clinical characteristics, including age, gestational age, cervical dilatation, employment status, education level, income, and prenatal education as well as the baseline outcome of labor pain (Table 1)

The univariate analysis of the primary outcome evaluation is presented in Table 2. Participants in the control group had increased levels of pain, after 60 minutes of the study. In the carrot juice and dark chocolate groups there were significant reductions in labor pain after intervention (Table 2).

The intervention effects on labor pain after the 60 minutes intervention was shown in Table 3. There were significant within-time-induced differences in pain labor before and after the intervention. After full adjustment,

the significance of the interaction group x time analysis for all biomarkers revealed that participants in the carrot juice group exhibited significant reductions in labor pain (β = -2.200; 95% CI = -2.252~-1.875). Besides, participants in the dark chocolate group had significant declines (β = -2.900; 95% CI = -3.297~-2.503) after the intervention compared to the control group (Table 3).

5. DISCUSSION

In this quasi-experimental study, we revealed that dark chocolate and carrot juice treatments significantly declined labor pain after the intervention among primigravida women. Our purpose was to compare the score labor pain intensity between the two interventional approaches and the control group. The results suggested

that the NPRS scores of the three groups showed significant differences. In accordance with prior research, which suggested dark chocolate (11), and carrot juice (15, 16) as a non-pharmaceutical, effective, and easy-to-use strategy for menstrual pain management, these data supported these recommendations.

In line with previous study, healthy participants who consumed chocolate powder decreased the nuclear factor-kappa B activation in peripheral blood mononuclear cells (21). In fact, labor was associated with activation of nuclear factor-kappa B and will be increased the prostaglandin (22). Endogenous opioids cause a euphoric mood and lower pain sensitivity by interacting with neurotransmitter systems (9), creating an analgesic effect to decline the pain. Another possible mechanism of dark chocolate reduced the labor pain, may be the mechanism of polyphenols' antioxidant and cortisol-lowering actions, have been proposed. For instance, catechin and epicatechin, the two most prevalent flavonoid molecules in cocoa, can pass the blood-brain barrier and exert neuroprotective benefits via antioxidative activity (23). In addition, a chocolate intervention rich in polyphenols decreased salivary cortisol levels, which is known to modulate the hypothalamic-pituitary-adrenal (HPA) axis (24). Given that the HPA axis is involved in pain and stress-related disorders (9, 24), the reduction in cortisol and polyphenols' antioxidant caused by chocolate consumption may contribute to the pain-regulating effects of cocoa.

In the present study, we found that the carrot juice with carotenoids compounds group had lower labor pain after an 8-week intervention compared to the control group. In addition, a previous study found that carotenoids had a strong inhibitory effect on prostaglandin (25); in fact, prostaglandin has an impact on the pain experienced during labor (26, 27). Carotenoids was significantly correlated with pain and antidepressant in Rats with fibromyalgia models (28). A meta-analysis study revealed that the potential antioxidant impact of carotenoids on reduce interleukin-6 (IL-6). IL-6 was significantly correlated with pain among primigravid mother during the first stage labor (29). Serum levels of carotene and lycopene were lower in women who gave birth prematurely due to spontaneous causes. In comparison, higher levels were associated with a decreased risk of premature birth (30). Consequently, carotenoids with both anti-inflammatory and antioxidant capabilities appear to be a prime example of naturally occurring chemicals able to relieve labor pain.

To the author's knowledge, this is the first study to examine the impact of dark chocolate and carrot juice therapies on labor pain among primigravida. Although identifying the immediate effects of a 30-minutes treatment is vital, long-term intervention and follow-up is also required. Our study did not examine the potential influence of individual differences in research on a family's or husband's support and physical activity before labor. Due to the study's quasi-experimental methodology, causality could not be determined. Future studies endeavored to investigate the previous physical activity,

explore the family's or husband's as well as the long-term intervention and follow-up.

6. CONCLUSION

This finding demonstrated that dark chocolate and carrot juice therapies independently lowered pain labor in primigravida mothers, making them a viable treatment for advanced pain labor. These results show that midwives and health professionals could play a significant role in enhancing intervention for women by advocating pain labor measures such as dark chocolate and carrot juice drinking in stage-1 of birth delivery among women with primigravida.

- **Patient Consent Form:** All participants were informed about subject of the study
- **Author's contribution:** F.F., A.Al and A.Ab. gave substantial contributions to the conception or design of the work in acquisition, analysis, or interpretation of data for the work. Y.A.R. contributed to data analysis. N.V., L.L., C.M and Y.A.R. had a part in article preparing for drafting or revising it critically for important intellectual content. All authors gave final approval of the version to be published and agreed to be accountable for all aspects of the work..
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REFERENCES

1. Nanji JA, Carvalho B. Pain management during labor and vaginal birth. *Best Practice & Research Clinical Obstetrics & Gynaecology*. 2020;67:100-112.
2. Alhafez L, Berghella V. Evidence-based labor management: first stage of labor (part 3). *American Journal of Obstetrics & Gynecology MFM*. 2020;2(4):100185.
3. Rhoades JS, Cahill AG. Defining and managing normal and abnormal first stage of labor. *Obstetrics and Gynecology Clinics*. 2017;44(4):535-545.
4. Koyyalamudi V, Sidhu G, Cornett EM, Nguyen V, Labrie-Brown C, Fox CJ, et al. New labor pain treatment options. *Current pain and headache reports*. 2016;20(2):1-9.
5. Huntley AL, Coon JT, Ernst E. Complementary and alternative medicine for labor pain: A systematic review. *American Journal of Obstetrics and Gynecology*. 2004;191(1):36-44.
6. Schuiling KD, Sampsel C, Kolcaba K. Exploring the presence of comfort within the context of childbirth. *Theory for midwifery practice*. 2011:197-214.
7. Czech I, Fuchs P, Fuchs A, Lorek M, Tobolska-Lorek D, Drosdzol-Cop A, et al. Pharmacological and Non-Pharmacological Methods of Labour Pain Relief—Establishment of Effectiveness and Comparison. *International Journal of Environmental Research and Public Health*. 2018;15(12):2792.
8. Mohamed HMS, Attia AA, Sayed EM. Effect of Non-Pharmacological Pain Relief Measures on Progress of Labor during First Stage of Labor. *International Journal of Novel Research in Healthcare and Nursing* 2020;7(1):988-996.
9. Eggleston KM, White T. Chocolate and Pain Tolerance. In: Watson RR, Preedy VR, Zibadi S, editors. *Chocolate in Health and Nutrition*. Totowa, NJ: Humana Press; 2013. p. 437-447.
10. Lagast S, De Steur H, Schouteten JJ, Gellynck X. A compar-

ison of two low-calorie sweeteners and sugar in dark chocolate on sensory attributes and emotional conceptualisations. *International journal of food sciences and nutrition*. 2018;69(3):344-537.

11. Maharani SI, Pramono N, Wahyuni S. Dark chocolate's effect on menstrual pain in late adolescents. *Belitung Nursing Journal*. 2017;3(6):686-692.
12. Boadi NO, Badu M, Kortei NK, Saah SA, Annor B, Mensah MB, et al. Nutritional composition and antioxidant properties of three varieties of carrot (*Daucus carota*). *Scientific African*. 2021;12:e00801.
13. Alasalvar C, Grigor JM, Zhang D, Quantick PC, Shahidi F. Comparison of volatiles, phenolics, sugars, antioxidant vitamins, and sensory quality of different colored carrot varieties. *Journal of Agricultural and Food Chemistry*. 2001;49(3):1410-1416.
14. Taavoni S, Fathi L, Nazem-Ekbatani N, Haghani H. The Effect of Oral Intake of Honey Syrup on the Pain Intensity of Active Phase of Parturition of nulliparous women: A Randomized clinical trial. *Caspian Journal of Internal Medicine*. 2019;10(1):98.
15. Fitria A, Marisa M. The Effect Of Giving Carrot Juice On Menstrual Pain In Young Women. *Science Midwifery*. 2022;10(4):3122-3126.
16. Ramayanti ED, Etika AN, Jayani I. Differences in the Effectiveness of Giving Carrot and Red Ginger Juice Against Menstrual Pain in Adolescents. *Jurnal Penelitian Perawat Profesional*. 2020;2(4):417-424.
17. Faul F, Erdfelder E, Lang A-G, Buchner A. G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior research methods*. 2007;39(2):175-191.
18. Uçar T, Golbasi Z. Effect of an educational program based on cognitive behavioral techniques on fear of childbirth and the birth process. *Journal of Psychosomatic Obstetrics & Gynecology*. 2019;40(2):146-155.
19. Hamdamian S, Nazarpour S, Simbar M, Hajian S, Mojab F, Talebi A. Effects of aromatherapy with *Rosa damascena* on nulliparous women's pain and anxiety of labor during first stage of labor. *Journal of integrative medicine*. 2018;16(2):120-125.
20. Pratitdya G, Rehatta NM, Susila D. Perbandingan interpretasi skala nyeri antara nrs-vas-wbfs oleh pasien pasca operasi elektif. *Care: Jurnal Ilmiah Ilmu Kesehatan*. 2020;8(3):447-463.
21. Vázquez-Agell M, Urpi-Sarda M, Sacanella E, Camino-López S, Chiva-Blanch G, Llorente-Cortés V, et al. Cocoa consumption reduces NF-κB activation in peripheral blood mononuclear cells in humans. *Nutr Metab Cardiovasc Dis*. 2013;23(3):257-263.
22. Choi SJ, young Oh S, Kim JH, Roh CR. Changes of nuclear factor kappa B (NF-κB), cyclooxygenase-2 (COX-2) and matrix metalloproteinase-9 (MMP-9) in human myometrium before and during term labor. *European Journal of Obstetrics & Gynecology and Reproductive Biology*. 2007;132(2):182-188.
23. Shin J-H, Kim C-S, Cha L, Kim S, Lee S, Chae S, et al. Consumption of 85% cocoa dark chocolate improves mood in association with gut microbial changes in healthy adults: a randomized controlled trial. *The Journal of Nutritional Biochemistry*. 2022;99:108854.
24. Tsang C, Hodgson L, Bussu A, Farhat G, Al-Dujaili E. Effect of polyphenol-rich dark chocolate on salivary cortisol and mood in adults. *Antioxidants*. 2019;8(6):149.
25. Bae J-Y, Park W-S, Kim H-J, Kim H-S, Kang K-K, Kwak S-S, et al. Protective Effect of Carotenoid Extract from Orange-Fleshed Sweet Potato on Gastric Ulcer in Mice by Inhibition of NO, IL-6 and PGE2 Production. *Pharmaceuticals*. 2021;14(12):1320.
26. Grace Ng YH, Aminuddin AA, Tan TL, Kuppusamy R, Tagore S, Yeo GSH. Multicentre randomised controlled trial comparing the safety in the first 12 h, efficacy and maternal satisfaction of a double balloon catheter and prostaglandin pessary for induction of labour. *Archives of Gynecology and Obstetrics*. 2022;305(1):11-18.
27. Jiang G-X, Jiang Q-Y, Mo H-X, Li L, Wang M-Y. Electroacupuncture for pain relief in labour inhibits spinal p38 MAPK-mediated prostaglandin E2 release and uterine prostaglandin E2 receptor expression in rats. *Acupuncture in Medicine*. 2019;37(2):116-124.
28. Elkholy NS, Shafaa MW, Mohammed HS. Cationic liposome-encapsulated carotenoids as a potential treatment for fibromyalgia in an animal model. *Biochimica et Biophysica Acta (BBA)-Molecular Basis of Disease*. 2021;1867(7):166150.
29. Rejeki S, Hartiti T, Machmudah M, Solichan A, Samiasih A, Soesanto E, et al. Effect of Regiosacralis Counterpressure Treatment on the Pain and Interleukin-6 (IL-6) Levels Among Primigravid Mothers During the First Stage Labor. *International Journal of Childbirth*. 2021;13(3):1-12
30. Kramer MS, Kahn SR, Platt RW, Genest J, Rozen R, Chen MF, et al. Antioxidant vitamins, long-chain fatty acids, and spontaneous preterm birth. *Epidemiology*. 2009;707-713.