

Impact of Digital Pocketbook-Based Nutrition Counseling on Knowledge and Nutrient Intake Among Obese Workers: A Quasi-Experimental Study

Paulina^{1*}, Riana Pangestu Utami¹, Rinten Anjang Sari¹, Aminah Toaha¹

¹ Department of Nutrition and Dietetics, Poltekkes Kalimantan Timur, Indonesia

Corresponding Author Email: paulinagizi@gmail.com

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ABSTRACT

Obesity remains a growing public health challenge; however, effective nutrition education strategies remain limited. A preliminary study conducted on December 15, 2024, at a community health center (Puskesmas) Manggar, Balikpapan, involving 10 obese workers, indicated that while participants recognized the definition of obesity, most lacked practical understanding regarding weight management and preventive dietary modification. Historically, nutrition education at this facility has been limited to leaflet distribution; therefore, there is a clear need for more interactive and sustainable intervention methods. This study aimed to analyze the impact of balanced nutrition counseling using a digital pocketbook as an educational medium on the knowledge and nutrient intake of obese workers at Puskesmas Manggar, Balikpapan. A quasi-experimental study with a one-group pretest-posttest design was conducted among 32 obese workers selected via total sampling. Knowledge (Guttman questionnaire) and nutrient intake (2×24-hour dietary recall) were assessed before and after intervention with digital pocketbook-based counseling and analyzed using the Wilcoxon signed-rank test. Results showed a significant improvement in knowledge, with scores shifting from "fair" and "poor" categories to "good" for all participants ($p < 0.001$). Intakes of energy, protein, fat, and carbohydrates also improved significantly, trending toward the normal range ($p < 0.001$). Pocketbook-based balanced nutrition counseling is effective in enhancing knowledge and optimizing nutrient intake among patients with obesity. Given its low cost and simplicity, this intervention is readily scalable for integration into routine nutrition counseling services at Puskesmas Manggar and other similar primary healthcare facilities..

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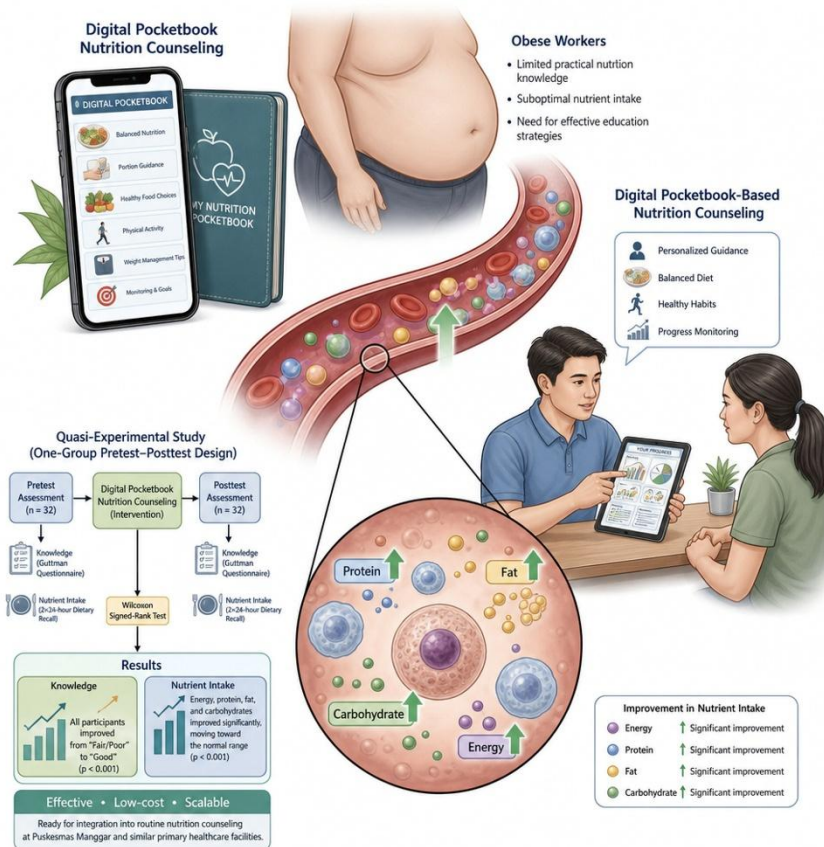


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Key Messages:

- Knowledge scores and reported macronutrient intake both moved toward target ranges after the counseling sessions, although the single-arm design cannot disentangle the intervention's contribution from secular change or repeated – testing effects.
- A pocketbook that participants can consult on their own pace and schedule is a low-burden addition to counseling at primary care level, where repeat face-to-face sessions are often difficult to arrange.

GRAPHICAL ABSTRACT



INTRODUCTION

Obesity is a chronic condition characterized by excessive body fat accumulation, which poses significant health risks (1). The World Health Organization (WHO) defines obesity based on Body Mass Index (BMI), categorizing individuals as overweight with a BMI ≥ 25 kg/m² and obese with a BMI ≥ 30 kg/m² (2). This condition results from an imbalance between energy intake and energy expenditure and is influenced by multifactorial determinants, including high-caloric dietary patterns, physical inactivity, genetics, and environmental factors (3).

Globally, the prevalence of obesity has steadily increased over the past few decades. The WHO (2024) reports that over one billion individuals worldwide are currently living with obesity, including 650 million adults, 340 million adolescents, and 39 million children (4). This trend is concerning, given that in 1975, the prevalence of obesity was only one-quarter of current levels. A similar trend is observed in Indonesia. Longitudinal survey results indicate that the prevalence of overweight among adults nearly doubled, rising from 17.1% in 1993 to 33.0% in 2014 (5). For the population aged ≥ 18 years, obesity prevalence ranges from 10.4% to 30.1%, depending on the province (5).

Recent data from *Riset Kesehatan Dasar (Riskesdas)* and the *Survei Kesehatan Indonesia (SKI)* demonstrate an upward trend in obesity prevalence across all provinces. According to the 2018 Riskesdas, central obesity prevalence was recorded at 31%, rising to 36.8% in the 2023 SKI (6). East Kalimantan is among the provinces with the highest obesity prevalence in Indonesia. An analysis by UNICEF (2024) reports that adult obesity prevalence in this province reaches approximately 4.7%, placing it in the highest national quintile (7). The situation in Balikpapan, as an urban center in East Kalimantan, is expected to follow national and provincial trends, although specific city-level data remain limited. This rising prevalence emphasizes the necessity for interventions at the primary healthcare level, specifically within *Puskesmas* (Community Health Centers).

Obesity has extensive consequences for both individual and public health. Individuals with obesity face a higher risk of developing non-communicable diseases (NCDs), such as type 2 diabetes mellitus,

hypertension, cardiovascular disease, dyslipidemia, and certain types of cancer, which globally contribute to premature mortality (2). Furthermore, obesity diminishes quality of life, impairs labour productivity, and increases the economic burden on both families and the state (3). Consequently, obesity prevention and management interventions are critical priorities in public health development.

Previous research has demonstrated that nutrition education plays a pivotal role in improving individual knowledge, attitudes, and behaviours regarding healthy dietary patterns (8). Nutrition counseling accompanied by educational media has been shown to be more effective in assisting individuals to grasp the concept of balanced nutrition compared to conventional education methods, such as leaflets or brief lectures (9). One medium considered practical and easily understood is the "pocketbook," which individuals can access at their convenience to reinforce information provided during counseling.

Systematic reviews indicate that digital health interventions for employees with obesity have thus far been dominated by web-based approaches, whereas other formats such as mobile applications or concise print/digital media remain considerably underutilized. Indeed, nearly all digital health interventions targeting employees with obesity have been delivered via web-based platforms, and the authors of these reviews explicitly recommend exploring more diverse delivery methods to reach working populations more flexibly and with less dependence on stable internet connectivity (10). Booklet-based educational media have been extensively studied in the context of nutrition interventions; however, few of these studies have specifically focused on employees with obesity. Likewise, limited research has examined digital booklets as an integral component of counseling sessions for this population.

A preliminary study conducted on December 2024, at *Puskesmas Manggar*, Balikpapan, involving interviews with 10 obese workers, revealed that while respondents understood the definition of obesity, most lacked practical understanding regarding weight management or obesity prevention through proper dietary modification. Historically, nutrition education provided by healthcare workers at this facility has been limited to leaflet distribution. This indicates a clear need for more interactive and sustainable educational methods. These observations underscore the rationale for the present study, to analyze the effect of balanced nutrition counseling, delivered using a digital pocketbook as a medium, on the improvement of knowledge and dietary patterns among obese workers at *Puskesmas Manggar*, Balikpapan.

METHODS

This study was conducted at the Manggar Community Health Center (*Puskesmas Manggar*), Balikpapan, from April to June 2025. We employed a quantitative approach using a quasi-experimental, one-group pretest-posttest design. This design was selected to evaluate the impact of balanced nutrition counseling, supported by a digital pocketbook as media, on the knowledge and nutrient intake of obese workers before and after the intervention.

The study population consisted of all employees diagnosed with obesity registered at *Puskesmas Manggar*. Using total sampling, a sample of 32 participants was recruited. Inclusion criteria were: (a) voluntary participation, and (b) documented obesity status at *Puskesmas Manggar*. Exclusion criteria included: (a) inability to complete the study follow-up, (b) presence of comorbidities preventing adherence to the prescribed dietary regimen, and (c) pregnancy or lactation.

The independent variable was balanced nutrition counseling mediated by an educational pocketbook. Counseling was delivered in two sessions, with one – week interval between the first and second sessions. Each session was conducted face-to-face and lasted 30 minutes. The intervention involved delivering information on obesity, guidance on daily dietary planning tailored to physiological needs, and emphasis on food diversity, physical activity, healthy living behaviors, and regular weight monitoring. The educational material consisted of a digital pocketbook delivered online, structured according to the Balanced Nutrition Counseling Lesson Plan (*Satuan Acara Penyuluhan/SAP*).

Dependent variables included knowledge and nutrient intake. Knowledge was assessed using a Guttman scale-based questionnaire (true/false) covering definitions, etiology, clinical signs, consequences, and prevention of obesity. Scoring categories, based on Arikunto, were: good (76–100%), fair (56–75%), and poor (<56%). Nutrient intake was assessed using two non-consecutive 24-hour dietary recalls,

conducted on one weekday and one weekend day to capture variation in nutrient intake, which were subsequently compared against the Indonesian Recommended Dietary Allowances (RDA) 2019 standards. Intake categories were classified as: deficient (<80% RDA), adequate (80–110% RDA), and excessive (>110% RDA).

This study received ethical approval from the Health Research Ethics Committee of the Health Polytechnic of the Ministry of Health, East Kalimantan (No: DP.04.03/KEPK/287/2025). Data analysis was conducted in stages, beginning with univariate analysis to describe participant characteristics, followed by the Wilcoxon signed-rank test to determine significant differences in knowledge and nutrient intake before and after the intervention.

RESULTS

As shown in Table 1, the majority of the respondents were female (62.5%) and fell within the late adulthood age group (30–59 years, 78.2%). Regarding educational attainment, over half of the participants held a bachelor's degree (53.1%). In terms of occupational physical activity levels, the majority of respondents reported engaging in light activity (46.9%). These data suggest that obesity in the study cohort was predominantly prevalent among females of productive age who possessed relatively high educational backgrounds but reported low levels of physical activity.

Table 1. Socio-demographic and Occupational Characteristics of Respondents (n=32)

Characteristics	n	%
Gender		
Male	12	37.5
Female	20	62.5
Age Group		
20-29 years old (Early adulthood)	7	21.9
30-59 years old (Late adulthood)	25	78.1
Education		
Senior high school	15	46.9
Tertiary/ Bachelor degree	17	53.1
Occupation		
Light	15	46.9
Moderate	11	34.4
Heavy	6	18.7

Table 2 presents the distribution of respondents' knowledge levels regarding balanced nutrition before and after the pocketbook-mediated counseling intervention. At baseline, 53.1% of the respondents possessed "fair" knowledge, while 46.9% were classified as having "poor" knowledge. Notably, no participants demonstrated "good" knowledge prior to the intervention. Following the intervention, a significant shift in knowledge distribution was observed, with 100% of respondents achieving a "good" knowledge classification. Consequently, no participants remained in the "fair" or "poor" categories post-intervention.

Table 2. Distribution of Respondent's Knowledge Levels Pre- and Post-Counseling Intervention (n=32)

Knowledge	Pre-intervention		Post-intervention	
	n	%	n	%
Poor	15	46.9	0	0
Fair	17	53.1	0	0
Good	0	0	32	100
Total	32	100	32	100

Table 3 illustrates the distribution of nutrient intake—specifically energy, protein, fat, and carbohydrates—among respondents before and after the pocketbook-mediated balanced nutrition

counseling. At baseline, the majority of respondents exhibited excessive intake for energy and protein (93.8%), while only a small minority fell within the normal (3.1%) or deficient (3.1%) categories. Similarly, for fat and carbohydrate intake, the majority of respondents presented with excessive consumption (96.8% and 93.8%, respectively).

Following the intervention, a significant shift in dietary patterns was observed. All respondents (100%) achieved normal energy and protein intake levels, with no remaining instances of deficiency or excess. Regarding fat and carbohydrate consumption, the majority of respondents successfully shifted to the normal category (84.4% and 87.5%, respectively), although a small percentage (15.6% and 12.5%) continued to exceed recommended intake levels.

Table 3. Distribution of Nutrient Intake Pre- and Post-Pocketbook Counseling Intervention (n=32)

Nutrient Intake	Criteria	Pre-intervention		Post-intervention	
		n	%	n	%
Energy (kcal)	Deficient	1	3.1	0	0
	Normal	1	3.1	32	100
	Excessive	30	93.8	0	0
Protein (gram)	Deficient	1	3.1	0	0
	Normal	1	3.1	32	100
	Excessive	30	93.8	0	0
Fat (gram)	Deficient	0	0	0	0
	Normal	1	3.1	27	84.4
	Excessive	31	96.9	5	15.6
Carbohydrate (gram)	Deficient	0	0	0	0
	Normal	1	3.1	28	87.5
	Excessive	31	96.9	4	12.5
Total		32	100	32	100

The results of the Wilcoxon signed-rank test are presented in Table 4. The analysis indicated that no respondents exhibited a decrease in knowledge scores (negative ranks = 0), while all 32 respondents (100%) showed an increase in knowledge following the balanced nutrition counseling intervention mediated by the pocketbook (positive ranks = 32). The test yielded a p-value of < 0.001, confirming a statistically significant difference between baseline and post-intervention knowledge levels. These findings demonstrate that pocketbook-based nutrition counseling is an effective method for improving knowledge among patients with obesity at *Puskesmas Manggar*.

Table 4. Effect of Balanced Nutrition Counseling via Pocketbook Media on Knowledge Levels

Knowledge		n	Mean Rank	Sum Of Rank	p-value*
Knowledge Scores (Pre-Post)	Negative Ranks	0	0,00	0.00	0.000
	Positive Ranks	32	16.50	528.00	
	Ties	0			
	Total	32			

* Wilcoxon Signed Rank Test analysis

Table 5 presents the results of the Wilcoxon signed-rank test comparing nutrient intake levels before and after the balanced nutrition counseling intervention. The analysis revealed statistically significant differences across all nutritional parameters—energy, protein, fat, and carbohydrate intake—between baseline and post-intervention measurements ($p < 0.001$ for all variables). The majority of respondents demonstrated a reduction in nutrient intake (negative ranks), indicating a shift toward normalized dietary consumption patterns among the obese population. No respondents exhibited an increase in intake (positive ranks), while a small number of respondents showed no change in dietary intake (ties). These findings confirm that pocketbook-mediated balanced nutrition counseling significantly improves dietary intake patterns in patients with obesity.

Table 5. Effect of Pocketbook-Based Balanced Nutrition Counseling on Nutrient Intake in Patients with Obesity

Nutrient Intake		Energy	Protein	Fat	Carbohydrate
Nutrient intake (Pre-Post)	Negative Ranks	28	27	31	29
	Positive Ranks	0	0	0	0
	Ties	4	5	1	3
	Total	32	32	32	32
	<i>p</i> -value	0.000	0.000	0.000	0.000

*Wilcoxon Signed Rank Test analysis

DISCUSSION

Effect of Balanced Nutrition Counseling via Pocketbook Media on Knowledge among Obese Workers

The findings of this study demonstrate that balanced nutrition counseling mediated by a pocketbook significantly improves knowledge levels among patients with obesity. The Wilcoxon signed-rank test yielded a $p < 0.001$, indicating a statistically significant difference in knowledge before and after the intervention. At baseline, the majority of the 32 respondents possessed "fair" (53.1%) or "poor" (46.9%) knowledge, with no participants achieving a "good" classification. Following the intervention, a notable improvement was observed, with 100% of participants attaining a "good" knowledge score. This finding suggests that counseling delivered through digital pocketbook may be associated with improved knowledge. These results are consistent with Nadiya and Fazira (2022), who reported that nutrition counseling effectively improves respondent knowledge (11). However, as this study employed a one-group design without a comparison group, the observed change cannot be firmly attributed to the intervention alone and may be influenced by another factors such as repeated assessment or concurrent information exposure.

Prior to the intervention, respondents demonstrated only a superficial understanding of obesity, such as basic definitions and clinical signs, while lacking a comprehensive grasp of health consequences and preventative strategies. Following two counseling sessions supported by the pocketbook, participants showed enhanced understanding, particularly regarding the health risks associated with obesity and actionable prevention strategies. This suggests that nutrition counseling successfully transitions participants from a theoretical conceptualization to a more applied understanding of obesity management.

These findings align with behavioral change theories that emphasize the role of education in enhancing awareness and motivation for lifestyle modification. Beauchamp et al. (2019) reported that theory-based counseling—incorporating goal setting, problem-solving, self-monitoring, and social support, such as Social Cognitive Theory (SCT)—is more effective than non-theoretical approaches (12). Similarly, Spahn et al. (2010) demonstrated via systematic review that counseling grounded in Cognitive Behavioral Theory (CBT) and motivational interviewing not only improves comprehension but also facilitates behavioral change (13). This reinforces the finding that counseling combined with accessible educational tools, such as a pocketbook, is essential for building motivation.

Furthermore, the improvement in knowledge was likely facilitated by the respondents' relatively high educational attainment (predominantly tertiary education). Higher education levels are associated with increased receptivity to health information. According to the Health Belief Model (HBM), increased knowledge regarding the severity of obesity and the benefits of prevention enhances the perception of risk, which can trigger preventative action. Simultaneously, the Theory of Planned Behavior (TPB) posits that knowledge acquisition contributes to the formation of positive attitudes, increases perceived behavioral control, and strengthens the intention to adopt healthy lifestyle changes. Thus, knowledge enhancement through nutrition counseling provides both the necessary conceptual framework and the behavioral precursors for future health-seeking actions (14) (15) (16).

The strengths of this study lie in its practical, simple, and cost-effective intervention method. The pocketbook serves as a versatile educational tool that allows respondents to self-monitor and review material independently at their convenience. Additionally, the two-session format proved sufficient to induce significant change, suggesting high efficiency for implementation in primary care settings such as *Puskesmas*. However, this study is subject to several limitations, including the absence of a control group,

which limits our ability to attribute knowledge improvement solely to the counseling intervention. The short duration and lack of long-term follow-up prevent assessment of the intervention's sustainability. Furthermore, since the majority of respondents possessed a tertiary education, generalizing these findings to populations with lower educational attainment should be done with caution.

Practically, these findings have significant implications for public health programs, particularly at the primary healthcare level. Nutrition counseling supported by simple media represents an effective strategy for increasing knowledge among patients with obesity. Healthcare workers at *Puskesmas* may utilize this method in routine practice, adjusting educational materials to the specific educational background of the target population. Future research should incorporate a control group, long-term follow-up evaluations, and measurements of actual behavioral and dietary changes to more comprehensively assess the efficacy of the intervention.

Effect of Balanced Nutrition Counseling via Pocketbook Media on Nutrient Intake among Obese Workers

The findings demonstrate significant changes in energy, protein, fat, and carbohydrate intake following the balanced nutrition counseling intervention mediated by the pocketbook. At baseline, the majority of respondents exhibited excessive energy and protein intake (93.8% for both). Fat (96.8% excessive) and carbohydrate (93.8% excessive) intakes were also notably high. Post-intervention, 100% of respondents achieved normal energy and protein intake levels. Regarding fat and carbohydrates, 84.4% and 87.4% achieved normal levels, respectively, while 15.6% and 12.5% remained in the excessive category. The Wilcoxon signed-rank test confirmed these findings ($p < 0.001$ for all parameters), demonstrating that nutrition counseling has a significant impact on controlling macronutrient intake. These results are supported by a systematic review of randomized controlled trials (RCTs) by Mitchell (2017), which reported that dietetic consultations for adults in primary healthcare settings are highly effective in improving dietary quality (17).

The success of this intervention aligns with previous findings. Hasniyati and Ismanilda reported that nutrition counseling significantly reduced energy intake post-intervention ($p < 0.05$) (18). Recent studies similarly indicate that counseling can optimize nutrient intake and nutritional status, although effects on the frequency of carbohydrate and fat intake may vary. Regarding protein consumption, respondents utilized both plant-based sources (tofu, tempeh, legumes, vegetables) and animal-based sources (meat, poultry, fish). Regarding protein consumption, respondents reported utilizing both plant – based sources (eg tofu, tempeh, legumes) and animal – based sources (eg : meat, poultry or fish) as part of their habitual diet, consistent with the general dietary pattern of Indonesian populations, in which soy – based foods such as tofu and tempeh are widely consumed as principal plant – protein sources (19). However, as this study did not conduct a formal food – group or dietary – source analysis, quantitative comparisons of specific protein – source contributions relative to recommended serving exchanges can't be drawn from the present data. Prior to the counseling, some respondents consumed excessive protein, particularly red meat or poultry. Post-intervention, macronutrient intake aligned better with recommendations as respondents began to restrict portions and regulate their dietary patterns (20). This shift is likely associated with the transition from unrestricted dietary habits to controlled consumption facilitated by the counseling. These findings are supported by previous studies demonstrating that nutrition counseling can effectively normalize protein intake (21)

Nutrition counseling aims not only to enhance knowledge but also to modify eating behaviors. According to Kurnik Mesarič et al. (2023), nutrition counseling utilizing theory-based approaches, such as Cognitive Behavioral Therapy (CBT) and motivational interviewing, is effective in facilitating changes in eating behaviors and healthy lifestyles. The pocketbook used in this study served as both an educational medium and a self-monitoring tool, delivered digitally. This digital educational media have been shown to support dietary self – monitoring and facilitate healthy eating behavior change, offering an accessible daily reference for food choices (22).

Structured nutrition education typically improves energy and protein adequacy (through better understanding of portion sizes and the frequency of animal/plant-based protein sources). However, there

remains a risk of increased fat or carbohydrate intake due to the accessibility and affordability of convenient processed foods (e.g., deep-fried items, sugar-sweetened beverages, instant noodles). Consequently, while energy and protein intakes may normalize, a subset of participants may shift toward excessive fat/carbohydrate consumption if the emphasis on quality and portioning is insufficient. This finding is consistent with literature on nutrition education interventions, which suggests that while dietary quality improves, specific "guardrails" concerning carbohydrate quality (glycemic index, fiber) and fat quality (reducing saturated and trans fats) are essential (23) (24).

In practice, the improvement in energy and protein intake following nutrition education is attributable to increased awareness of balanced portion principles and food variety. Nevertheless, persistent excessive fat and carbohydrate intake suggests that environmental factors, such as the high accessibility and affordability of energy-dense, nutrient-poor foods (e.g., fried foods and sugary snacks), continue to influence dietary habits.

This study confirms that balanced nutrition counseling utilizing simple media, such as a pocketbook, is effective in mitigating the risk of excessive nutrient intake among obese workers. Such interventions have the potential to be adopted by Puskesmas as a routine program, particularly for working populations vulnerable to high-energy, high-fat dietary patterns. These findings provide evidence that simple, practical, and accessible educational media contribute significantly to fostering healthier eating behaviors.

The strengths of this study include the practical and efficient counseling methodology, which yielded significant results in only two sessions; the cost-effective and applicable nature of the pocketbook media; and the successful modification of dietary patterns in a high-risk group. However, this study has limitations. The absence of a control group limits the ability to definitively establish causality. The intervention duration was relatively short, leaving the long-term sustainability of these dietary changes unknown. Furthermore, the use of 24-hour dietary recall or Food Frequency Questionnaires (FFQ) may be subject to recall bias. Finally, the majority of respondents possessed high educational attainment, which suggests that generalizing these findings to populations with lower education levels should be conducted with caution.

CONCLUSION

This study suggests that balanced nutrition counseling using pocketbook media can enhance knowledge and support the optimization of nutrient intake among obese workers, within the context of a pre and post design without control group. Following the intervention, all participants achieved a good knowledge classification, and improvements were observed in energy and macronutrient intake. These findings indicate that the pocketbook intervention is a feasible and low – resource strategy for supporting healthier dietary behaviors, although its cost – effectiveness has not to been formally evaluated and need further analysis.

For future implementation, we recommend transitioning this educational material into interactive digital formats (e.g., mobile applications or e-books) that incorporate educational features, automated reminders, and dietary calculators. Furthermore, this counseling model should be integrated into routine Puskesmas services and national health initiatives, such as the Non-Communicable Disease (NCD) and GERMAS programs. Sustained outcomes could be further supported by establishing workplace-based peer support groups and utilizing digital platforms (e.g., messaging groups or automated reminders) for longitudinal monitoring. Additionally, alternative media, such as nutrition-focused comics or infographics, may be effective for populations with lower literacy levels, while collaboration with employers is essential to foster workplace environments that support healthy dietary habits.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. Saraswati SK, Rahmaningrum FD, Pahsya MNZ, Paramitha N, Wulansari A, Ristantya AR, et al. Literature Review : Faktor Risiko Penyebab Obesitas. *Media Kesehatan Masyarakat Indonesia*. 2021;20(1):70–4.
2. Kluwer W. Obesity and overweight: A global public health issue. *Advances in Human Biology*. 2022;2022–4.
3. Abbafati C, Abbas KM, Abbasi-Kangevari M, Abd-Allah F, Abdelalim A, Abdollahi M, et al. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*. 2020;396(10258):1223–49. doi:10.1016/S0140-6736(20)30752-2 PubMed PMID: 33069327.
4. UNICEF, WHO, WORLD BANK. Level and trend in child malnutrition. World Health Organization. 2023;4.
5. Li M, Gong W, Wang S, Li Z. Trends in body mass index, overweight and obesity among adults in the USA, the NHANES from 2003 to 2018: A repeat cross-sectional survey. *BMJ Open*. 2022;12(12):1–10. doi:10.1136/bmjopen-2022-065425 PubMed PMID: 36526312.
6. Kesehatan BKP. Survei Kesehatan Indonesia. Kota Kediri Dalam Angka. 2023;1–68.
7. UNICEF. Landscape Analysis of Overweight: Summary of Key Findings. Kementerian Kesehatan RI. 2024;1(2):1–48.
8. Fachira Kasmarini, Ratih Kurniasari. Pengaruh Pemanfaatan Media Edukasi Gizi untuk Meningkatkan Pengetahuan Terkait Anemia pada Remaja Putri: Literature Review. *Media Publikasi Promosi Kesehatan Indonesia (MPPKI)*. 2022;5(11):1329–35. doi:10.56338/mppki.v5i11.2291
9. Hasanah N, Hidayah N, Safaria T. Peningkatan Kemampuan Pertolongan Psikologis Awal Melalui Pelatihan Konseling Dasar pada Kader Posyandu Desa Pogung. Vol. 04. 2023;04(01). doi:10.51673/jaltn.v4i1.1372
10. Lee Y, Lee NY, Lim HJ, Sung S. Weight Reduction Interventions Using Digital Health for Employees with Obesity: A Systematic Review. *Diabetes, Metabolic Syndrome and Obesity*. 2022 Oct 13;15(13):3121–31. doi:10.2147/DMSO.S384450
11. Nadiya S, Fazira F. Pengaruh Scrapbook Sebagai Media Konseling Terhadap Pengetahuan Tentang Resiko Kekurangan Energi Kronis (KEK) Pada Remaja di SMA Negeri 1 Juli Kabupaten Bireuen. *journal of healthcare Technology and Medicine*. 2022;8(1):127–36.
12. Beauchamp MR, Crawford KL, Jackson B. Social cognitive theory and physical activity: Mechanisms of behavior change, critique, and legacy. *Psychol Sport Exerc*. 2019;42(November):110–7. doi:10.1016/j.psychsport.2018.11.009
13. Spahn JM, Reeves RS, Keim KS, Laquatra I, Kellogg M, Jortberg B, et al. State of the Evidence Regarding Behavior Change Theories and Strategies in Nutrition Counseling to Facilitate Health and Food Behavior Change. *J Am Diet Assoc*. 2010;110(6):879–91. doi:10.1016/j.jada.2010.03.021 PubMed PMID: 20497777.
14. Yastica TV, Salma SA, Caesaron D, Safrudin YN, Pramadya AR. Application of Theory Planned Behavior (TPB) and Health Belief Model (HBM) in COVID-19 Prevention: A Literature Review. 6th International Conference on Interactive Digital Media, ICIDM 2020. 2020;(Icidm). doi:10.1109/ICIDM51048.2020.9339605
15. David R, Stephan V den B, Van Hal Guido F. The health belief model and theory of planned behavior applied to mammography screening : a systematic review and meta-analysis. *Public Health Nurs*. 2021;38(3):482–92.

16. Jiang N, Chen J, Cao H, Liu Y, Zhang Y, Wang Q, et al. Parents' intentions toward preschool children's myopia preventive behaviors: Combining the health belief model and the theory of planned behavior. *Front Public Health*. 2022;10. doi:10.3389/fpubh.2022.1036929 PubMed PMID: 36504939.
17. Mitchell LJ, Ball LE, Ross LJ, Barnes KA, Williams LT. Effectiveness of Dietetic Consultations in Primary Health Care: A Systematic Review of Randomized Controlled Trials. *J Acad Nutr Diet*. 2017;117(12):1941–62. doi:10.1016/j.jand.2017.06.364 PubMed PMID: 28826840.
18. Hasniyati R, Ismanilda I. Konseling Gizi terhadap Perubahan Perilaku Makan, Indeks Massa Tubuh dan Lemak Tubuh pada Anak Overweight dan Obesitas. *Jurnal Keperawatan Silampari*. 2021 Dec 29;5(1):541–50. doi:10.31539/jks.v5i1.2951
19. Sistia F, Khusun H, Februhartanty J. Plant protein consumption is associated with body mass index among women of reproductive age in Indonesia. *Front Nutr*. 2023 Oct 18;10:1–7. doi:10.3389/fnut.2023.1243635
20. Hassani B, Amani R, Haghighizadeh MH, Araban M. A priority oriented nutrition education program to improve nutritional and cardiometabolic status in the workplace: A randomized field trial. *Journal of Occupational Medicine and Toxicology*. 2020 Feb 13;15(1):1–9. doi:10.1186/s12995-020-0252-y
21. Kusumaningrum R, Pudjirahayu A. Konseling Gizi Terhadap Pengetahuan Gizi Dan Sikap Ibu, Pola Makan Serta Tingkat Konsumsi Energi Dan Protein Balita Gizi Kurang. *Jurnal Informasi Kesehatan Indonesia*. 2021;4(1):53–63.
22. Kurnik Mesarič K, Pajek J, Logar Zakrajšek B, Bogataj Š, Kodrič J. Cognitive behavioral therapy for lifestyle changes in patients with obesity and type 2 diabetes: a systematic review and meta-analysis. *Sci Rep*. 2023;13(1):1–10. doi:10.1038/s41598-023-40141-5 PubMed PMID: 37550475.
23. Kocanda L, Brain K, Frawley J, Schumacher TL, May J, Rollo ME, et al. The Effectiveness of Randomized Controlled Trials to Improve Dietary Intake in the Context of Cardiovascular Disease Prevention and Management in Rural Communities: A Systematic Review. *J Acad Nutr Diet*. 2021;121(10):2046–2070.e1. doi:10.1016/j.jand.2021.05.025 PubMed PMID: 34247977.
24. Raut S, KC D, Singh DR, Dhungana RR, Pradhan PMS, Sunuwar DR. Effect of nutrition education intervention on nutrition knowledge, attitude, and diet quality among school-going adolescents: a quasi-experimental study. *BMC Nutr*. 2024;10(1):1–10. doi:10.1186/s40795-024-00850-0