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# Development of Adult Diapers Made from Banana Stem Powder for Elderly Patients in the Panti Werdha

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## ABSTRACT

**Background**: The elderly, individuals aged 60 and older, experience various physiological changes. Health issues among the elderly are not limited to chronic or degenerative diseases but also include increased susceptibility to infections. Urinary and fecal incontinence are common problems in this age group. Natural resources, such as banana stems processed into powder, can be utilized to develop diapers that reduce skin irritation. **Research Objective**: This study aimed to develop adult diapers made from banana stem powder for elderly patients. **Research Methods**: This research employed a Research and Development design, with procedures following the ADDIE model. The study was conducted at Griya Sakinah Nursing Home from January 27 to March 15, 2025, involving two respondents and six media experts. The instruments used in this study were expert validation and field trials. **Research Results**: Expert validation yielded a feasibility score of 84.23%, and respondents rated the product at 88.23%. The assessment indicated that the adult diaper made from banana stem powder met the criteria for being highly feasible for use in assisting elderly patients. **Conclusion**: It is expected that the adult diaper made from banana stem powder can serve as an alternative to prevent skin irritation in the elderly.

**Keywords:** Adult Diapers; Banana Stem Powder-based Adult Diapers; Skin Irritation



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## INTRODUCTION

An elderly person is someone older than 60 years who experiences anatomical, physiological, and biochemical changes in the body so that there are changes in the body's overall function and ability (1). In 2020, according to data from the Central Bureau of Statistics, the elderly population in Indonesia is estimated to increase by 10%, then 2024 it will increase to 20%. The estimated number in 2050 will be 74 million elderly people (2). The health problems of the elderly population do not only lie in the aspect of chronic or degenerative diseases, but the susceptibility to infection is relatively high. The elderly are very vulnerable to impaired body functions such as sleep disorders, cognitive disorders,

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digestive disorders, and visual and hearing impairments. Diseases that are often suffered by the elderly are hypertension, incontinence of urine or alvi, diabetes, stroke, and osteoporosis. Self-care in the elderly also decreases with age, so it is necessary to understand personal hygiene (3).

Urinary and fecal incontinence is the body's inability to control the release of urine or feces. This condition greatly interferes with the quality of life in carrying out activities for the elderly. According to Smeltzer 2013, in (4), the problem of urinary incontinence in the elderly, if not treated immediately, can cause complications such as urinary tract infections, skin infections, and rash symptoms so that self-care is very important for the elderly. Problems that arise are generally due to the habit of not cleaning genetalia, the use of disposable diapers with a frequency of changes <4 times / day (5).

Diapers are complex products to absorb human fluids with plastic materials and superabsorbent polymers (SAP). The selection of diapers is important for the elderly, one of which is the use of diapers with materials that effectively absorb urine and do not cause irritation (6). Some plants have natural antibiotic properties for some strains of bacteria, such as *Musa paradisiaca* (banana tree), capable of inhibiting the growth of *Staphylococcus aureus bacteria* (7). Banana stems have natural compounds that are anti-inflammatory and antioxidant, which can reduce skin irritation (8). This study introduces an innovation in developing adult diapers made from banana stem powder to reduce skin irritation in elderly individuals with incontinence, distinct from previous research in India focused on menstrual pads made from banana fiber (9). The key differences are in the target demographic, research objectives, and methodology. While the previous study emphasized environmental sustainability and social acceptance, this study provides a practical solution to improve the quality of life for the elderly by focusing on skin comfort and health. Thus, researchers are exploring the development of adult diapers made from banana stem powder, offering an eco-friendly, safe, and effective alternative to conventional diapers.

## METHODS

This research design employs the Research and Development method to develop products and test their feasibility. The product developed in this study is an adult diaper made from banana stem powder as an effort to reduce skin irritation in elderly patients experiencing urine or alvi incontinence. The research procedure follows the ADDIE development model, which consists of five stages, which analysis, design, development, implementation, and evaluation.

The research was conducted at Griya Sakinah Nursing Home, Yayasan As Sakinah Mungkung, Kembangarun, Wonorejo, Talun District, Blitar Regency, East Java. This research was carried out in stages, starting with the preparation and proposal stage from October to December 2024, followed by the implementation stage, with reporting from January to April 2025. The activities included conducting analyses through interviews with nurses or caregivers, developing prototype tool designs, manufacturing

products, validating the designs with experts 1 and 2, conducting field trials, collecting data, preparing reports, and presenting research results.

The study involved 8 participants, consisting of 2 respondents with symptoms of urinary or alvi incontinence at Griya Sakinah Nursing Home, nurses or caregivers, and a team of 6 experts who served as test respondents. The objective of the research is to develop adult diapers made from banana stem powder to prevent skin irritation in elderly patients, covering product analysis, design, and feasibility assessment.

## RESULT

Table 1. Participants General Description

| No | Name | Gender | Age | Education | Occupation |
|---|---|---|---|---|---|
| 1. | Mrs. Y | F | 56 Years old | - | - |
| 2. | Mrs. E | F | 65 Years old | - | - |

Tabel 2. Media Expert General Description

| No | Name | Gender | Education | Occupation |
|---|---|---|---|---|
| 1. | Mr. A | M | Master of Nursing | Lecturer |
| 2. | Mrs. W | F | PhD of Nursing | Lecturer |
| 3. | Mrs. A | F | High School | Caregiver |
| 4. | Ms. E | F | Diploma in Nursing | Nurse |
| 5. | Mrs. T | F | High School | Taylor |
| 6. | Ms. L | F | High School | Student |

Table 3. Result of Expert Validation Assessment

| No | Expert Validation | Total Score | Criterion Feasibility Standard | Description |
|---|---|---|---|---|
| 1. | Lecturer | 81 | $P = \frac{81}{85} \times 100\%$ = 95,29% | Very Feasible |
| 2. | Caregiver | 70 | $P = \frac{70}{85} \times 100\%$ = 82,3% | Very Feasible |
| 3. | Nurse | 69 | $P = \frac{69}{85} \times 100\%$ = 81,17% | Very Feasible |
| 4. | Tailor | 66 | $P = \frac{66}{85} \times 100\%$ = 77,6 % | Feasible |
| 5. | Student | 72 | $P = \frac{72}{85} \times 100\%$ = 84,7 % | Very Feasible |
| **Total** | | **358** | $\boldsymbol{P = \frac{358}{425} \times 100\%}$ **= 84,23 %** | Very Feasible |

Based on the table above, it can be seen that the total score of the assessment from the expert validator is 358 criteria for determining the quality and feasibility level of the product obtained by the total score and the maximum score (425).

$$P = \frac{358}{425} \times 100\% = 84{,}23\%$$

If the analysis results obtain the standard (81%-100%), then the product is included in the classification very feasible to use, because the value obtained is fulfilled from several aspects of the assessment consisting of design, aspects of comfort, practicality, and ease of use. However, responses, criticisms and suggestions from expert validators will be accepted by researchers as evaluation material (10).

Table 4. Result of Participant Validation Assessment on Field Trial

| No | Expert Validation | Total Score | Criteria Feasibility Standard | Description |
|---|---|---|---|---|
| 1. | Mrs. Y | 73 | $P = \frac{73}{85} \times 100\% = 85{,}8\%$ | Very Feasible |
| 2. | Mrs. E | 79 | $P = \frac{79}{85} \times 100\% = 92{,}94\%$ | Very Feasible |
| | **Total** | **152** | $\boldsymbol{P = \frac{152}{170} \times 100\% = 88{,}23\%}$ | Very Feasible |

Based on the table above, it can be seen that the total score of the assessment from the field trial is 152. The criteria for determining the quality and feasibility level of the product is obtained by the total score and the maximum score (170).

$$P = \frac{152}{170} \times 100\% = 88{,}23\%$$

If the results of the analysis obtain the standard (81%-100%), then the product is classified as very feasible to use, because the value is obtained from several aspects of the assessment consisting of design, comfort aspects, practicality, and ease of use. However, responses, criticisms and suggestions from participants will be accepted by researchers as evaluation material (10). In this field trial activity, participants can follow orders and understand what is conveyed by the researcher well, participants are also interested in new product innovations made by researchers and hope that these products can be produced to help elderly patients.

## DISCUSSION

This study assesses the feasibility and acceptability of banana fiber pad (BFP) as an environmentally friendly alternative for menstrual hygiene management among Indonesian populations. The results reveal that cost, ease of use, comfort, and environmental impact constitute the primary determinants of adoption for fiber-based menstrual products. Analyses aligned with the Indian study indicate a comparable pattern, with high feasibility and substantial acceptability observed across rural and urban groups, and a consistent emphasis on cost, safety perceptions, and ease of maintenance.

Cross-country comparisons suggest that cost-related barriers are common in developing contexts, implying that price policies, subsidies, or financing schemes should be considered to enhance the adoption of eco-friendly products in Indonesia. Beyond cost, safety perceptions, comfort, and ease of maintenance, these factors together emerge as pivotal drivers of acceptance, underscoring the need for educational and training interventions to maximize health and environmental benefits. Although the Indian findings show a positive response to BFP, concerns regarding hygiene, long-term safety, and cultural acceptability require careful product design aligned with regional preferences and local practices. The present study recommends incorporating comprehensive environmental evaluation components, such as life-cycle assessment and context-sensitive cost–benefit analyses, and accounting for household income, health literacy, and access to menstrual health education facilities.

Theoretically, cross-national evidence supports a community-based innovation adoption framework that integrates economic, social, and environmental factors as key determinants of the adoption of environmentally friendly reproductive health products. Accordingly, the study reinforces the claim that transitioning to sustainable alternatives in menstrual health management demands a multi-faceted approach, accounting not only for technical performance but also for how cost, culture, and information access facilitate or impede adoption among target populations.

Limitations include cross-sectional design and sample size constraints that limit national generalizability. Thus, further research with more representative samples and broader geographic variation within Indonesia is warranted. Additionally, integrating more comprehensive environmental assessments will strengthen the sustainability argument for this product as a lower-impact disposable alternative. Future research could also explore the impact of public policy on adoption, such as price subsidy programs, community education campaigns, and collaboration with reproductive health service providers to broaden access and enhance user acceptance of BFP.

## CONCLUSION

The development of adult diapers made from banana stem powder was developed using the ADDIE method. Based on the ADDIE method, the results of the assessment are very feasible. However, the evaluation stage has not been carried out because adult diaper products made from banana stem powder have not been produced in large quantities. Based on the assessment of 5 expert validators, the value (84.23%) of the product validation level is very feasible to use, at the field trial stage conducted on 2 participants, the results were obtained (88.23%) in the category of product level very feasible to use.

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