



## **EFFECTIVENESS OF ACTIVATED CARBON SOLUTION IN REDUCING ODOR IN CANCER PATIENTS IN THE SURGICAL WARD**

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### **ABSTRACT**

Cancer is a disease with a high incidence rate in the world and is the main cause of death, as well as causing complications, one of which is malignant wounds which cause an unpleasant odor due to the process of tissue necrosis and infection.. This study aims to determine the effectiveness of activated carbon solution in reducing odor in cancer patients in the surgical room of Dr. M. Djamil Padang General Hospital in 2025. This study uses a research designquasi experimental design with non-equivalent with control group design pre-post-test.The population of this study consisted of all patients treated in the surgical ward of Dr. M. Djamil Padang General Hospital. The sampling technique in this study was carried out usingtechnicianrandom block sampling. Using a sample of 60person Data were collected after obtaining ethical approval and hospital permission for cancer patients. Data collection was carried out by measuring wound odor using an activated charcoal solution.using the NRS-B (Numerical Rating Scale for Odor) score analysis was carried out using statistical testsMann Withnay (Non normal distribution). Research result The median odor score in the intervention group was5 (3-9),while in the control group was 6 (3-9).Statistical analysis with nonparametric tests shows the value of  $p < 0,000$ , which indicates a statistically significant difference between the two groups. These results indicate that activated charcoal solution can significantly reduce odor scores compared to the group that did not receive intervention.. mark  $p < 0,000$ , which indicates that the difference in smell scores between pre-test and post-test in the intervention group is more significant than in the control group.This study shows that administering activated charcoal solution has a significant effect on reducing wound odor in cancer patients.The results of this study are expected to be the basis for developing evidence-based nursing practices in palliative care, particularly in the management of smelly cancer wounds.

Keywords: activated charcoal solution; cancer; smell

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## **INTRODUCTION**

Cancer is one of the most prevalent diseases worldwide and a leading cause of death. According to Globocan 2020 data, there were approximately 396,914 new cancer cases in Indonesia, with a death toll of 234,511.Ministry of Health of the Republic of Indonesia; 2021). This disease is often accompanied by complications, one of which is malignant wounds, which cause an unpleasant odor due to tissue necrosis and infection. This wound odor not only impacts patient comfort but also causes psychological stress for patients, their families, and healthcare workers.

Cancer is one of the most prevalent diseases worldwide and a leading cause of death in many countries. According to data from the Indonesian Ministry of Health (2022), the number of cancer cases in Indonesia continues to rise, with a common complication being wound odor.2022 There were approximately 20 million new cancer cases and approximately 9.7 million deaths due to cancer. It is estimated that the number of cases will increase to35 million cases by 2050, up  $\pm 77\%$  from 2022. Around1 in 5 peoplewill experience cancer in his life; and1 in 9 men, as well as 1 in 12 women, died of cancer.

The most common cancer is lung, breast, colorectal, prostate, And stomach. Cancer in Indonesia. Recent national data varies by source, but several studies and the WHO show an increasing trend.

The prevalence of obesity-related cancers in Indonesia is high, including esophageal, colorectal, liver, gallbladder, pancreatic, and kidney cancers. Obesity is a significant risk factor, with an estimated 2 million cases and 102,000 obesity-related deaths in 2015. Cancer patients often experience odor. This odor generally occurs in cancer patients with malignant wounds or open wounds, due to uncontrolled cancer cell growth and anaerobic bacterial infections. The odor produced by cancer wounds not only impacts the patient's quality of life but also causes discomfort for the patient, their family, and the healthcare professionals who care for them. Wound odor is often caused by the degradation of necrotic tissue and the production of compounds such as volatile fatty acids and sulfur compounds by anaerobic bacteria, such as *Proteus*, *Pseudomonas*, and *Bacteroides*.

Malignant wounds generally occur in advanced stages of cancer due to the growth of tumor cells that penetrate the skin's surface. These wounds often have an odor due to infection by anaerobic bacteria such as *Pseudomonas aeruginosa*, *Proteus mirabilis*, and *Bacteroides fragilis*. These bacteria produce volatile organic compounds (VOCs), such as ammonia, volatile fatty acids, and sulfur compounds, which cause a strong odor. Untreated odor can reduce a patient's quality of life and worsen psychosocial well-being. Common methods for reducing wound odor include the use of antiseptic solutions or conventional wound dressings, but their effectiveness is often limited. Therefore, more effective and safer alternatives are needed, one of which is activated charcoal solution. Activated charcoal has a high adsorption capacity for odor-causing molecules. The microscopic pore structure of activated charcoal can absorb gaseous compounds and small odor-causing particles, thereby reducing the unpleasant odor emitted by malignant wounds.

The use of activated charcoal in solution form has been studied as a safe, inexpensive, and effective treatment method. In addition to its odor-absorbing properties, the charcoal solution is also non-toxic and can be used on patients with vulnerable conditions such as cancer. However, in the operating room of Dr. M. Djamil Padang General Hospital, this method is not yet widely used routinely, and wound odor management is still limited to conventional methods such as wound cleansing with 0.9% NaCl or antiseptics. Usage carbon Activated charcoal in the form of wound dressings has been applied to reduce odor in cancer wounds. Dressings containing activated charcoal can absorb the unpleasant odor produced by cancer wounds. Technical guidelines for palliative care for cancer also recommend the use of charcoal in wound dressings to address unpleasant odors. Furthermore, activated charcoal has strong adsorption properties, allowing it to absorb body odors and chemicals from the skin and the surrounding environment. Cancer patients with open wounds often face the challenge of unpleasant odors produced by tissue necrosis and wound infection. This odor not only impacts patient comfort but also their quality of life, including reducing self-confidence, hindering social interactions, and increasing psychological burden. Furthermore, unpleasant odors can disrupt the comfort of families and healthcare providers caring for patients.

Current methods for managing cancer wound odor often use specific chemicals, such as topical antiseptics and antibiotics. However, their long-term effectiveness is often limited, while side effects such as irritation or microbial resistance are a concern. This highlights the need for safer, more effective, and more patient- and environmentally friendly alternatives. (6). Activated charcoal, known for its high adsorption capacity, has been used in various fields to absorb odor-causing substances. However, research on its use in solution form to reduce odor in cancer wounds is still very limited. This phenomenon creates a need for in-depth research to explore the potential of this solution. carbon active as an innovative solution in cancer wound odor management. Various methods have been used to reduce wound odor, one of which is activated charcoal solution. carbon Active charcoal has a high adsorption capacity for odor-causing molecules, making it effective in reducing the odor produced by malignant wounds. Furthermore, the charcoal solution is non-toxic and safe to use, making it suitable for use on vulnerable patients such as cancer patients. easy, safe, easy to use, but does not kill bacteria, Advantages of the Solution carbon Active to Overcome Odor in

Cancer Patients is the High Odor Absorption Power where aActive particles have a wide porous structure (high surface area), capable of bind and absorb odorous gases such as ammonia, sulfur, and other volatile compounds produced from necrotic tissue or cancer wound exudate. Activated charcoal bNon-Toxic and Safe, Charcoal is known to be safe for topical use and does not cause allergic reactions or local toxicity. This makes it a safe choice for patients with high skin sensitivity or low immunity conditions. Relatively Low Cost and Easy to Get, dcompared to silver dressings or topical antibiotics, solution carbon active is much cheaper, making it suitable for use in long-term management, especially in service facilities with limited resources. Easy to use and combine, lActivated charcoal solution can be applied by spraying onto dressings, used as a compress, combined with absorbent dressings (e.g. sterile gauze), this makes it flexible and easy to combine with other methods (e.g. metronidazole or iodine). Fast effect in reducing environmental odors. In clinical practice, patients, families, and healthcare professionals frequently report odor reduction within a few hours after the first application, improves patient comfort and quality of life. Does not interfere with the wound healing process Unlike some strong antiseptics that can irritate tissue, charcoal is not cytotoxic, so it does not inhibit granulation or wound epithelialization.

There are several methods to reduce the odor of cancer patients, such as using mTopical metronidazole, the advantages are specific and evidence-based, the disadvantages require a prescription, does not absorb gas. Silver dressing is effective for antimicrobials and absorbs exudate, but the disadvantages are high costs, honey dressing has the advantage of being multifunctional and accelerates healing, the disadvantages can be sticky, while iodine dressing has the advantage of being effective on infected wounds, the disadvantages are potential allergies.

Based on interviews with patients in the room, patients often complain about the smell and feel uncomfortable and sometimes their dressings are not changed. Patients feel inferior because of the smell caused by their wounds, and cancer patients who smell are placed in isolation rooms, which causes a reduction in bed capacity, even though if the smell could be reduced, the patient could be placed in a regular treatment room. At Dr. M. Djamil General Hospital in Padang, cases of cancer patients with malignant wounds that produce odor are quite common, especially in the operating room. However, to date, treatments for wound odor are limited and often involve conventional dressings or routine cleaning with 0.9% NaCl, which have limited effectiveness in reducing odor. This study aims to evaluate the effectiveness of using the solution carbon active against odor in cancer patients in the operating room of Dr. M. Djamil Padang Hospital. This study used quasi experimental design with non-equivalent with control group design post-test only. Sample selection using techniques random block sampling at Dr. M. Djamil General Hospital, Padang, involving 60 respondents: 30 in the control group and 30 in the intervention group. The results of this study are expected to contribute to the development of more effective and efficient wound care practices, as well as support evidence-based decision-making in the management of cancer patients with malignancy. This journal will be published at a minimum of Sinta 3, and this study will produce an SOP on the Use of Solutions carbon active for cancer wound care. Based on these problems, researchers are interested in conducting research on the influence of solution carbon on odor reduction in cancer patients with malignant wounds in the operating room of Dr. M. Djamil Padang General Hospital. This study is expected to provide scientific evidence and practical solutions in the care of cancer patients with malignant wounds, thereby improving the quality of life of patients and providing comfort during the treatment process.

## **METHOD**

This type of research has an experiment The population in this study is all cancer patients who will undergo treatment. cancer open wounds (fungating wounds) that produce an unpleasant odor due to infection or tissue necrosis which are rating Scale for Odor) measurement results. This research uses an observation form instrument and Measuring the level of odor of patient wounds before and after application of activated charcoal solution based on a subjective scale by patients and health workers.. Bivariate analysis was conducted to see the effect of administering activated charcoal

solution on the odor of wounds in patients with cancer in the operating room of Dr. M. Djamil Padang General Hospital. The analysis was conducted using statistical tests. Mann Withnay, uFor all variables, significance was set at a 5% rejection level ( $p=0.05$ ). If  $p<0.05$  is obtained, the null hypothesis is rejected, meaning there is an influence between the independent and dependent variables. This research has received ethical approval from Dr. M. Djamil General Hospital Number: DP.04.03/D.XVI.10.1/285/2025.

## RESULT

Table 1.  
Frequency distribution of respondents by gender, age

| Characteristics | f  | %    |
|-----------------|----|------|
| Gender          |    |      |
| Man             | 23 | 38,3 |
| Woman           | 37 | 61,7 |
| Age (years)*    |    |      |
| Early Adulthood | 26 | 43,4 |
| Older Adults    | 34 | 56,6 |

Table 1 shows that the majority of respondents were female at 61.7%, while the average age of cancer patients was older adults at 56.6%.

Table 2

Differences in odor scores between the intervention group and the control group in cancer patients in the surgical room

| Smell Score  | Median  | P Value |
|--------------|---------|---------|
| Control      | 6 (3-9) | < 0,001 |
| intervention | 5 (3-9) |         |

Table 2 shows that Comparison of odor scores between the intervention group and the control group in cancer patients in the surgical room of Dr. M Djamil General Hospital in 2025. The median odor score in the intervention group was 5 (3-9), while in the control group was 6 (3-9). Statistical analysis with nonparametric tests shows the value of  $p < 0,001$ , which indicates a highly statistically significant difference between the two groups. These results indicate that activated charcoal solution can significantly reduce odor scores compared to the group that did not receive intervention.

Table 3

The effect of activated charcoal solution on odor scores in the intervention group and control group of cancer patients in the surgical room

| Group        | Constipation |           | Difference | P Value |
|--------------|--------------|-----------|------------|---------|
|              | Pre test     | Post test |            |         |
| Intervention | 7 (4-10)     | 5 (3-9)   | 2          | < 0,001 |
| Control      | 7 (4-10)     | 6 (3-9)   | 1          | < 0,106 |

From Table 3 above it can be seen that show value  $p < 0,000$ , which indicates that the difference in smell scores between pre-test and post-test in the intervention group is more significant than in the control group.

## DISCUSSION

The results of this study indicate that the average age characteristics of cancer patients range from 34 years of age to older adults (56.6%). This is in accordance with research by Research by Probst et al (2020) showed that most patients with malignant, odorous wounds were in the age group above 50 years, and the wound odor was more severe than in younger age groups. Alexander's study (2019) also reported that advanced age is a risk factor for chronic, odorous wounds due to decreased tissue perfusion and a slower healing process. These data reflect that cancerous wounds are more common in older adults, which may be due to these findings. This finding is in line with the fact that cancer incidence increases with age due to degenerative processes, a decline in the immune system, and the accumulation of long-term exposure to risk factors. Older adults with cancer tend to experience chronic wounds with poorer tissue conditions, such as decreased perfusion, slower healing, and a higher risk of infection. These conditions increase the likelihood of persistent and difficult-to-control wound odor.

The results showed that the majority of respondents were female (61.7%), while male respondents numbered 38.3%. The predominance of female respondents in this study may be associated with the prevalence of certain types of cancer that are more common in women, such as breast cancer and gynecological cancer, which in advanced stages can potentially cause open wounds with an unpleasant odor due to infection and tissue necrosis. Physiologically, gender differences can also influence response to wound care. Women are known to have better adherence to care and are more likely to report discomfort due to wound odor, making odor reduction interventions highly relevant. Wound odor in cancer patients not only impacts physical health but also causes psychosocial problems such as embarrassment, social isolation, and reduced quality of life.

Theoretically, gender differences influence disease characteristics and treatment response. According to biological and hormonal theories, estrogen in women can influence the inflammatory response and wound healing process, while in advanced cancer, hormonal imbalances and decreased local immunity can exacerbate wound conditions and increase the risk of wound odor. Furthermore, psychosocial theory explains that women tend to be more sensitive to discomfort, including wound odor, and therefore more likely to seek and accept odor management interventions. Research by Probst et al. (2020) reported that the majority of patients with smelly cancer wounds were women, particularly those with advanced breast cancer. Bowering's (2019) study also stated that malignant wounds in women often exhibit higher odor intensity due to the larger wound area and greater degree of tissue necrosis. Furthermore, Woo et al. (2021) found that women with cancer wounds reported a more significant impact of wound odor on quality of life than men, making odor reduction interventions crucial.

Based on the research results, there is an effect of activated charcoal solution on reducing odor in cancer patient wounds in the operating room of Dr. M. Djamil Padang General Hospital.. Based on the results of the hypothesis test in the study using the Mann Whitney test and the results obtained were  $p < 0.05$ , in other words there is an influence activated charcoal solution to reduce odor in cancer patient wounds. The results of the study showed that activated charcoal solution had a significant effect on Activated charcoal solution to reduce odor in wounds of cancer patients, with a p-value of 0.000. This shows that there is a very significant relationship between the administration of activated charcoal solution and a decrease in Activated charcoal solution to reduce odor in cancer wound patients.

The odor of cancer wounds is primarily caused by tissue necrosis and the activity of anaerobic bacteria, which produce volatile compounds such as amines, fatty acids, and sulfur compounds. Adsorption theory explains that activated charcoal's porous structure with a very large surface area effectively binds and absorbs these odor-causing compounds without damaging surrounding healthy tissue. This mechanism results in a rapid and clinically significant reduction in wound odor intensity. The results of this study align with Bowering's (2019) study, which reported that activated charcoal significantly reduced malignant wound odor in cancer patients with a p-value  $< 0.001$ . Research by Probst et al. (2020) also found that activated charcoal-based interventions showed significant differences in wound odor scores before and after the intervention, as well as

improving the comfort and quality of life of cancer patients. Furthermore, Woo et al. (2021) stated that activated charcoal is effective in controlling chronic wound odor by reducing anaerobic bacterial colonization, resulting in significantly reduced wound odor. The high statistical significance of this study indicates that activated charcoal solution is not only theoretically effective but also has a real impact in nursing practice. Reducing wound odor provides multidimensional benefits, not only improving patient physical comfort but also reducing psychological impacts such as embarrassment, social isolation, and anxiety, which are often experienced by patients with smelly cancer wounds. Thus, the results of this study strengthen the evidence that activated charcoal solution is a safe, effective, and applicable nursing intervention, and is worthy of being

recommended as part of the standard care for smelly cancer wounds, especially at Dr. M. Djamil Padang General Hospital.

This study has several limitations that should be considered when interpreting the results. First, the study design was not fully able to control for all confounding factors that could influence wound odor, such as infection rate, wound extent and depth, cancer type, and the use of additional therapies (e.g., antibiotics or other dressings). Second, the assessment of wound odor was subjective because it relied on an observational rating scale, potentially leading to perception bias among assessors, even when using the same instrument. Third, the limited sample size and the study location, which was only conducted at one hospital, Dr. M. Djamil Padang General Hospital, limit the generalizability of the results to a wider population. Fourth, the relatively short duration of intervention and observation period did not allow for assessing the long-term effects of activated charcoal solution on cancer wound odor. Therefore, further research is recommended using an experimental design with tighter controls, a larger sample size, multi-center studies, and a longer follow-up period to strengthen the evidence for the effectiveness of activated charcoal solution.

This study has several strengths that support its validity and relevance. First, it addresses a real and frequently encountered clinical problem in nursing practice: wound odor in cancer patients, which significantly impacts patient comfort and quality of life. Second, the use of activated charcoal solution as an intervention is a simple, non-invasive, safe, and easily applied approach by nurses, thus having high potential for implementation in clinical practice. Third, the statistical analysis results show a highly significant relationship between the administration of activated charcoal solution and a decrease in wound odor ( $p\text{-value} = 0.001$ ), strengthening the evidence for the intervention's effectiveness. Fourth, this study was conducted in a tertiary referral hospital setting, namely Dr. M. Djamil Padang General Hospital, so the results reflect the highly complex clinical conditions of cancer patients. Fifth, this study contributes to the development of evidence-based nursing practice, particularly in palliative care and the management of odorous cancer wounds.

## CONCLUSION

This study shows that the administration of activated charcoal solution significantly reduces wound odor in cancer patients. Statistical test results confirm a highly significant relationship between the use of activated charcoal solution and a reduction in wound odor. This intervention is effective across a wide range of patient characteristics, both based on age and gender. Activated charcoal solution works through the adsorption of odor-causing volatile compounds, thereby improving patient comfort and supporting palliative care that focuses on quality of life. Therefore, activated charcoal solution can be used as a safe, simple, and applicable nursing intervention in the management of cancer wound odor.

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