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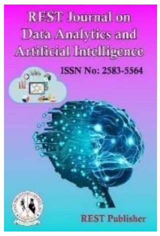

Analyzing Global Trends in Skin Cancer Prevention Strategies using decision making tools

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ABSTRACT

Skin cancer is a common and dangerous disease that results from the abnormal growth of skin cells. It is primarily caused by excessive exposure to ultraviolet (UV) radiation from sunlight or artificial tanning devices. When UV radiation damages the DNA of skin cells, it disrupts their normal growth and division, leading to the formation of malignant tumors. The three main types of skin cancer are melanoma, basal cell carcinoma, and squamous cell carcinoma, each of which differs in severity and ability to spread to other parts of the body. Since skin cancer most often appears on the surface of the skin, early detection through self-examination and regular skin exams is very important. Preventive strategies such as using sunscreen, wearing protective clothing, and minimizing UV exposure play a key role in reducing the risk. Ongoing research and public awareness efforts contribute significantly to improving diagnosis, treatment, and survival rates. In medical decision-making, the weighted sum model is used to evaluate and rank various treatment options. This method assigns weights to important criteria such as effectiveness, survival rate, side effects, pain management, cosmetic outcome, cost and recovery time. Treatment alternatives including surgery, radiation therapy, chemotherapy, immunotherapy, targeted therapy, photodynamic therapy, cryotherapy and herbal remedies are evaluated and multiplied by their weights. Based on the overall rating, targeted therapy received the highest ranking, while herbal remedies received the lowest ranking.

1. INTRODUCTION

Skin cancer appears to be less common among individuals with darker skin tones compared to fair-skinned Caucasians. However, when it does occur in people with darker skin, it often leads to more severe outcomes and higher mortality rates. As a result, it is crucial for medical professionals to possess comprehensive knowledge about skin cancer in order to proactively identify and address these tumors among individuals with darker skin tones. Enhancing the ability to detect such cancers at an early stage is of paramount importance, with the ultimate goal of reducing the impact of skin cancer within this demographic [1]. Skin cancer is a prevalent type of tumor that tends to occur more frequently in Caucasians. It affects a substantial number of individuals over their lifetimes, presenting a significant risk, especially in the United States. When compared with other types of cancer, skin cancer leads to a higher number of cases, totaling up to around 800,000 people. The two main categories Non-melanoma skin cancer, i.e. basal cell carcinoma (PCC) and squamous cell carcinoma (SCC) are this year found in the US it is expected that. Melanoma, a form of skin cancer, is primarily influenced by exposure to sunlight and other environmental factors, rather than non-cutaneous triggers [2]. Melanoma, alongside non-malignant skin

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cancers like NMSC, constitutes a prevalent form of skin cancer. It is most frequently observed among individuals with fair skin. Melanoma stands out as the predominant type of malignancy within this category. The occurrence of melanoma is progressively rising on a global scale, while the related mortality rates are either maintaining stability or experiencing a slight decline [3]. Cancer affecting the skin, which of Cancer in the United States most frequently identified is the observed form, it is a significant step by step as a public health concern is changing. In 2006, non-melanoma skin about 1.3 of cancer million events (NMSC) were managed, highlighting the extensive nature of the issue. Furthermore, an additional 60,000 cases of multiple melanomas were identified by 2010. The occurrence of both NMSC and melanoma is on the rise, leading to an increasing burden on healthcare resources. Despite this, there remains limited knowledge regarding the economic impact and other aspects of these conditions [4]. Skin cancer, encompassing Basal Cell Carcinoma (BCC), Squamous Cell Carcinoma (SCC), and melanoma, is largely triggered by exposure to sunlight. The prevalence of each type is influenced by factors such as skin tone and level of sun sensitivity. People with fair skin and limited tolerance to sunlight are more susceptible to these cancers compared to individuals with darker skin and greater sun resistance. Elevated solar radiation due to environmental changes elevates the risk further. The likelihood of cancer development is higher in regions of the body with higher sun exposure and lower coverage. Outdoor labor and recreational sun exposure, particularly in cases of melanoma and BCC, are associated with an increased risk, along with a history of sun exposure and the presence of benign sun-induced skin damage [5]. The skin, constituting the body's largest component, accounts for approximately 16% of total body weight. It is structured into two main layers known as the Epidermis and Dermis, which consist of various elements, including epithelial and mesenchymal tissues, as well as glandular and nervous components. Derived from the ectoderm, the epidermis forms the outermost layer that comes into contact with the external environment, safeguarding the body against factors like pathogens, chemicals, UV radiation, and other environmental challenges. This barrier function shields the body from both physical and chemical stresses [6]. Skin cancer is widespread and can be divided into two main categories: Malignant Melanoma and Non-Melanoma Skin Cancer (NMSC). NMSC encompasses subtypes like Basal Cell Carcinoma (BCC) and Squamous Cell Carcinoma (SCC). The exact count of NMSC cases is challenging to ascertain due to the fact that not all instances of BCC and SCC are required to be reported to National Cancer Registries[7]. Researchers in various countries, including the United States, are advocating for revisions to the registration standards for NMSC, aiming to improve accuracy and consistency in tracking these cases [8]. Death resulting from non-melanoma skin cancer is infrequent, making it a distinctive and noteworthy aspect of this disease. Analyzing its specific characteristics is particularly vital for medical understanding. Despite its relatively uncommon occurrence, the prevalence of non-melanoma skin cancer is on the rise at a rapid pace. Nevertheless, the latest nationwide assessments of this type of cancer span only a 16-year period [9]. Skin cancers are identifiable by specific skin lesions, which can also aid in their detection, particularly in cases of arsenic exposure through drinking water[10]. Our comprehension of skin cancer has undergone remarkable advancements over the past 5 to 10 years, leading to significant developments in the scientific realm. Traditionally, our knowledge about skin cancer has been rooted in medical observations and microscopic examinations. While we understood that ultraviolet radiation (UVR) plays a role in initiating alterations, the underlying mechanisms were not extensively supported by scientific proof. For instance, the progression from Actinic Keratosis (AK) to more advanced forms like metastatic Squamous Cell Carcinoma (SCC) was often discussed, but lacked substantial scientific validation [11]. Skin cancer, a consequential manifestation of abnormal cell growth within the skin's tissues, holds a prominent position in the realm of oncology. As one of the most prevalent forms of cancer worldwide, its impact spans across various demographics and geographical regions. This group of malignancies encompasses several types, with the primary ones being Malignant Melanoma and Non-Melanoma Skin Cancer (NMSC), which includes Basal Cell Carcinoma (BCC) and Squamous Cell Carcinoma (SCC) [12]. The significance of skin cancer lies not only in its prevalence but also in its link to ultraviolet (UV) radiation exposure, predominantly from the sun [13]. The risk factors for skin cancer are multifaceted, encompassing both intrinsic factors such as skin type, genetic heritage, and family history, as well as extrinsic factors like excessive sun exposure, tanning bed usage, and environmental factors. Fair-skinned individuals are particularly susceptible due to reduced melanin protection against UV radiation. Moreover, regions with intense sunlight, high altitudes, and reduced ozone layers tend to observe higher incidences of skin cancer. Early detection is a pivotal aspect in managing skin cancer. Regular self-examinations and professional skin assessments are essential for spotting suspicious moles, lesions, or irregularities. The efficacy of treatments varies depending on the type and stage of cancer, ranging from localized removal of tumors to more aggressive interventions such as surgery, chemotherapy, and targeted therapies [14]. In conclusion, skin cancer's prominence in the realm of oncology underscores the urgency of understanding its causes, risk factors, and preventative measures. While UV radiation remains a primary contributor, advancements in research have illuminated the complexities of its development and progression. With an increasing focus on education, awareness, and early detection, the medical community strives to mitigate the impact of this significant health concern on individuals' well-being [15].

2. MATERIAL AND RESEARCH METHODS

Efficacy: Efficacy refers to how well a treatment works in achieving its intended goals. In the context of cancer treatment, efficacy may be measured by the reduction in tumor size or the elimination of cancer cells. High efficacy indicates that the treatment is successful in targeting and addressing the disease. Survival Rate: Survival rate is a crucial measure in cancer treatment. It indicates the percentage of patients who survive a specified period after diagnosis or treatment. High survival rates are indicative of the treatment's ability to prolong a patient's life, and they are often categorized into short-term (e.g., 5-year survival) and long-term (e.g., 10-year survival) rates. Side Effects: Side effects are unintended consequences of a treatment. They can range from mild to severe and may affect various aspects of a patient's health and quality of life. Evaluating side effects helps patients and healthcare professionals weigh the benefits of treatment against potential drawbacks and make informed decisions. Pain Management: Pain management is critical, especially in cancer treatments, as patients may experience pain due to the disease itself or as a side effect of treatment. Effective pain management ensures a better quality of life during and after treatment. Different pain management strategies, including medications and non-pharmacological approaches, may be employed. Cosmetic Outcome: Cosmetic outcome assesses how a medical intervention impacts a patient's appearance. In treatments like surgery or radiation therapy for skin cancer, maintaining or improving cosmetic appearance is an important consideration. Treatments that leave minimal scarring or disfigurement are often preferred. Cost: The cost of a treatment can vary widely depending on the type of cancer, stage, treatment modalities used, and healthcare system. Patients and their families often need to consider the financial aspects, including insurance coverage, out-of-pocket expenses, and potential long-term costs when making treatment decisions. Time to Recovery (weeks): The time it takes for a patient to recover from treatment is a significant factor. Shorter recovery times are generally preferable, as they allow patients to resume their normal activities and daily routines sooner. However, this may vary depending on the type and extent of treatment. Surgery: Surgical removal of cancerous tissue is a primary treatment for many types of cancer. It aims to physically remove the tumor and any nearby affected tissue. Surgery is often curative if the cancer is localized and hasn't spread to other parts of the body. It may also be used for staging and diagnosing cancer. Radiation Therapy: Radiation therapy uses high-energy X-rays or other particles to target and destroy cancer cells. It is often employed after surgery to kill remaining cancer cells or as a standalone treatment when surgery is not possible. Radiation therapy can also help alleviate symptoms in advanced cancer cases. Chemotherapy: Chemotherapy involves the use of drugs to kill cancer cells or prevent their growth and division. It can be administered orally or intravenously and is often used when cancer has spread throughout the body. While chemotherapy can be effective, it can also cause various side effects, as it may affect healthy cells as well. Immunotherapy: Immunotherapy harnesses the body's immune system to target and destroy cancer cells. It includes various approaches, such as checkpoint inhibitors, CAR-T cell therapy, and monoclonal antibodies. Immunotherapy is a promising treatment for various cancers and is known for its potential to induce durable responses with fewer side effects compared to traditional chemotherapy. Targeted Therapy: Targeted therapy focuses on specific molecular or genetic alterations that drive cancer growth. It uses drugs designed to interfere with these specific targets, which are often proteins or pathways involved in cancer progression. Targeted therapies are most effective when the cancer has identifiable genetic mutations. Photodynamic Therapy: Photodynamic therapy (PDT) involves the use of a photosensitizing agent and light to destroy cancer cells. The agent is absorbed by cancer cells, and when exposed to light, it produces a reactive oxygen species that kills the cells. PDT is often used for superficial cancers, such as skin or certain types of lung cancer. Cryotherapy: Cryotherapy involves freezing and destroying cancer cells by applying extremely cold temperatures. It is commonly used for small, localized tumors, especially in the skin or prostate. Cryotherapy is minimally invasive and can be done as an outpatient procedure. Herbal Remedies: Herbal remedies refer to the use of plants, plant extracts, or natural compounds for cancer treatment or symptom management. While some herbal remedies may have potential benefits, they are not a substitute for conventional cancer treatments. It's crucial to consult with a healthcare professional before using any herbal remedies, as they can interact with other treatments or medications. WSM Method: The Weighted Sum Method (WSM) is an approach for decision-making and optimization that assesses and contrasts multiple alternatives through a set of criteria. It offers a structured means of amalgamating these criteria, each with its own significance, into a single value. This facilitates informed decision-making by quantitatively evaluating the alternatives. As far as we know, current solutions for dealing with continuous multi-objective optimization problems predominantly hinge on precedence relations. In a traditional weighted sum model, unstrained solutions are eliminated through an optional link, as referenced. [16]. A method for ranking cameras It is suggested to use the Weighted Sum Method (WSM) when making decisions based on multiple factors. This system employs WSM to compute preference scores for different camera options. In the WSM framework, weights are assigned to team scores and features. Customer reviews serve as scores, while the weight concept is defined as the average number of customers served, as explained in the document. [17]. The discussion covers both the Weighted Sum and the power source Weighted Product methods are utilized. The Weighted Sum technique assigns major weights to each attribute; the total of an option's assessments determines its score. In contrast, performance scores—rather than efficiency scores—are determined when using the Weighted Product approach. Changing the number of times has an effect on the score's significance, with the power being raised to enhance its importance, as detailed in the text [18]. The Weighted Sum Method involves a blend of multiplication and subtraction and is applied to add and organize candidate keywords. We've previously covered the generation and depiction of these keywords. It employs a weighted sum of a four-dimensional feature vector, though this weighted sum undergoes changes during the process. The four features have unique parsing capabilities due to the weight requirements. This keyword attribute enhances discrimination, resulting in more effective manual detection. However, manually determining the weight vector for the domain is excessively time-consuming, as indicated in the text [19]. The suggested adaptive weighted sum system prioritizes predetermined weight choices instead of altering weights. It introduces extra inequalities and specific restrictions to tackle uncharted territories, particularly in non-convex regions. This adaptive approach generates solutions that are both non-Pareto and distributed, in contrast to top-ranked solutions that frequently miss more advantageous alternatives. The potential downside of crossing normal boundaries is underscored, with a focus on the reliance on equality constraints as a significant concern in this effective versatile method, as mentioned in the text [20]. Regarding weighted sum multi-objective optimization (MOO), the method, although reliable, is not the most efficient for producing multiple solution points by varying weights. Nevertheless, it incorporates a single-answer set selection that showcases alternatives and consistently offers that point. The approach exposes options to varying weights and is versatile when applied to different methods [21]. This paper presents a weighted sum technique for a clinical computer-assisted algorithm used in trauma diagnosis. Trauma is a highly significant medical issue with immediate physiological consequences. The method utilizes probability weights established by medical experts in a knowledge base, which includes comprehensive information on different types of shock. The findings, derived from the analysis of data from nine patients, offer a cumulative ranking of shock types based on a combination of two-level weights [22]. The Weighted Sum Method is a common feature in evolutionary multi-objective algorithms like the moea/d-lws algorithm, as suggested in. This research aims to harness the benefits of the Weighted Sum Method, applying it to non-convex problems to tackle challenges frequently encountered by other techniques. In the field of multi-objective optimization, the Weighted Sum Method enjoys broad utilization because of its systematic approach to weight adaptation [23] This approach systematically adjusts weights, leading to distinct optimal solutions for each individual objective optimization. These solutions are then compared with front approximations, where unspecified anchor points are assigned values of 0. Importantly, the weighted sum method has been a fixture in optimization settings since its inception [24]. Among various options, the weighted sum approach is widely acknowledged and commonly used. The suggested algorithm employs three objective functions – base pair score, entropy, and weight fully matched column (WFMC) – during the selection process, which are combined using a weighted sum technique to create a comprehensive similarity measure. The proposed Gray-Weighted Sum Model (GWSM) takes into consideration factors such as data ranges, usage, and alternatives, influencing the results and accounting for uncertainties. Gambia, situated in West Africa, is identified as the top-ranked country. However, considering environmental uncertainty over an extended period, GWSM's long-term suitability for investors is considered relatively high [25].

STEP 1: Design of Decision Matrix and Weight Matrix

For an MCDM problem consisting of m alternatives and n criteria, let $D = [x_{ij}]$ be the decision matrix, where $x_{ij} \in \mathbb{R}$.

$$D = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}$$

The weight vector is expressed as:

$$\mathbf{w} = [w_1, w_2, \ldots, w_n]$$

subject to the normalization condition:

$$\sum_{j=1}^{n} w_j = 1$$

STEP 2: Normalization of Decision Matrix

The normalized decision matrix is computed as:

$$n_{ij} = \begin{cases} \dfrac{x_{ij}}{\max x_{ij}}, & j \in B \quad \text{(benefit criteria)} \\ \dfrac{\min x_{ij}}{x_{ij}}, & j \in C \quad \text{(cost criteria)} \end{cases}$$

STEP 3: Weighted Normalized Decision Matrix

The weighted normalized values are calculated as:

$$W_{nij} = w_j \, n_{ij}$$

STEP 4: Ranking of Alternatives

The ranking score for the i^{th} alternative using the Weighted Sum Model (WSM) is:

$$S_i^{\text{WSM}} = \sum_{j=1}^{n} w_j \, n_{ij}$$

where:

- S_i^{WSM} is the ranking score of the i^{th} alternative,
- w_j is the weight of the j^{th} criterion,
- n_{ij} is the normalized value.

The alternatives are ranked in descending order. The alternative with the highest S_i^{WSM} value is assigned the highest rank.

3. RESULT AND DISCUSSION

TABLE 1. Decision Matrix for Skin Cancer Treatment Alternatives

Treatment	Efficacy	Survival Rate	Side Effects	Pain Mgmt	Cosmetic Outcome	Cost	Recovery (weeks)
Surgery	90.0	95.0	5.0	3.0	7.0	10000.0	4.0
Radiation Therapy	80.0	90.0	6.0	4.0	6.0	12000.0	6.0
Chemotherapy	70.0	75.0	8.0	7.0	3.0	15000.0	8.0
Immunotherapy	95.0	96.0	4.0	2.0	8.0	20000.0	3.0
Targeted Therapy	85.0	92.0	5.0	3.0	7.0	18000.0	5.0
Photodynamic Therapy	75.0	85.0	7.0	5.0	5.0	14000.0	7.0
Cryotherapy	88.0	91.0	6.0	4.0	6.0	11000.0	4.0
Herbal Remedies	60.0	70.0	9.0	8.0	2.0	5000.0	10.0

Table 1 provides an overview of different treatment options for skin cancer across several key evaluation criteria. Efficacy, measured as a percentage, represents the effectiveness of each treatment in achieving complete remission. Survival rate indicates the percentage of patients surviving for at least 5 years post-treatment, offering insight into long-term outcomes. The side effects and pain management scores help assess the treatment's tolerability and patient comfort during the process. Cosmetic outcome reflects the impact on the patient's appearance post-treatment, which can be important for their quality of life. Cost considerations and time to recovery in weeks provide practical information for decision-making. Overall, the table aids in comparing these treatments to make informed choices based on these crucial factors when addressing skin cancer.

TABLE 2. Normalized Data

Efficacy	Survival Rate	Side Effects	Pain Mgmt	Cosmetic Outcome	Cost	Recovery (weeks)
0.94737	0.98958	0.55556	0.37500	0.87500	0.50000	0.40000
0.84211	0.93750	0.66667	0.50000	0.75000	0.60000	0.60000
0.73684	0.78125	0.88889	0.88000	0.38000	0.75000	0.80000
1.00000	1.00000	0.44444	0.25000	1.00000	1.00000	0.30000
0.89474	0.95833	0.55556	0.38000	0.88000	0.90000	0.50000
0.78947	0.88542	0.77778	0.63000	0.63000	0.70000	0.70000
0.92632	0.94792	0.66667	0.50000	0.75000	0.55000	0.40000
0.63158	0.72917	1.00000	1.00000	0.25000	0.25000	1.00000

Table 1 presents normalized data for the evaluation criteria of different skin cancer treatment options. Normalization is a process that scales values within a range of 0 to 1, allowing for a standardized comparison of the criteria. In this table, higher normalized values represent better performance for each criterion. For instance, a normalized efficacy score of 1.0 indicates the highest effectiveness, while a score of 0.0 would suggest the lowest. Similarly, a normalized cost score of 0.0 signifies the lowest cost, making it more favorable. This normalized data facilitates a more objective comparison of the treatment options, as it removes the influence of different measurement scales. It helps decision-makers identify the treatment option that best balances efficacy, survival rate, side effects, pain management, cosmetic outcomes, cost, and time to recovery when considering skin cancer treatment.

The image labeled as 1 Normalized Data" displays a line graph illustrating the normalization of various factors related to skin cancer treatment. The x-axis represents these different factors, while the y-axis shows their respective values after being rescaled within a range of 0 to 1. In this scenario, all factors have equal weight, implying that the cost of cosmetic treatments doesn't receive more importance than other factors like efficacy or survival rate. The graph clearly indicates that the cost of cosmetic treatments is comparatively lower in relation to the other factors. This suggests that, within the context of this normalized data, cosmetic treatments are generally perceived as a more cost-effective option. However, it's crucial to emphasize that the data in this graph is normalized, so it doesn't provide precise cost figures. Actual costs for cosmetic treatments can vary based on factors such as treatment type, location, and provider expertise. In summary, the image highlights that, in this normalized dataset, the cost of cosmetic treatments is a relatively minor consideration

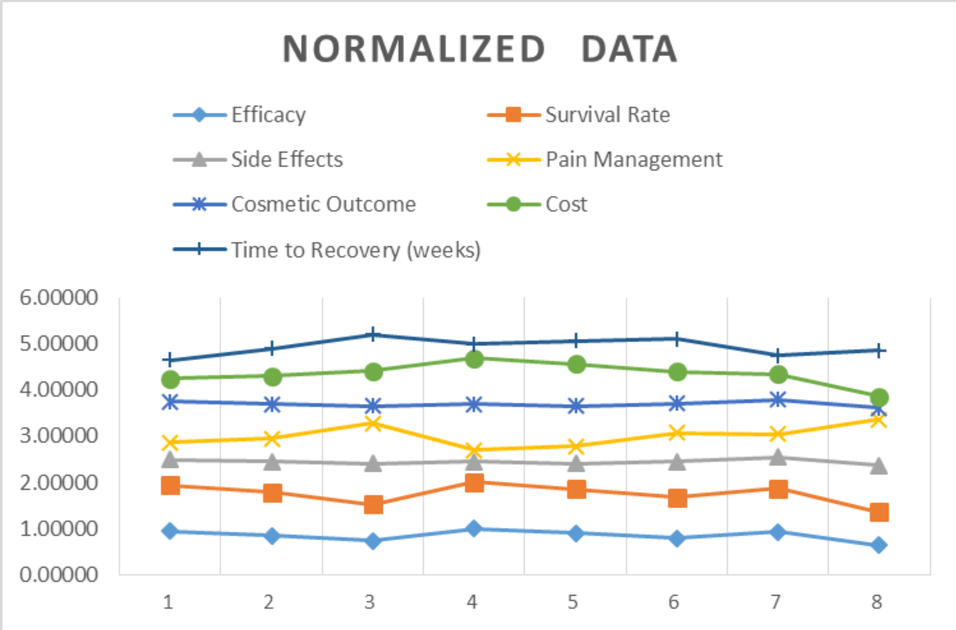

FIGURE 1. Normalized Data

compared to other critical factors like efficacy, survival rate, side effects, and pain management. Nonetheless, it's important to remember that these are normalized values and not actual cost figures.

TABLE 3. Weight

w_1	w_2	w_3	w_4	w_5	w_6	w_7
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25

Table 3 represents the weight assigned to each evaluation criterion when making a decision about skin cancer treatment options. In this case, all criteria have been given equal weight, with each criterion being assigned a weight of 0.25. Equal weighting implies that all criteria are considered equally important when evaluating and comparing the treatment alternatives. This approach ensures a balanced consideration of all factors without emphasizing any particular criterion over others during the decision-making process.

TABLE 4. Weighted normalized decision matrix

w_1	w_2	w_3	w_4	w_5	w_6	w_7
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25	0.25

Table 4 is the Weighted Normalized Decision Matrix, which combines the normalized evaluation criteria with the assigned weights to quantify the overall performance of each skin cancer treatment option. Each cell in the table represents the weighted and normalized score for a specific treatment criterion and alternative. For instance, the cell at the intersection of "Surgery" and "Efficacy" (0.23684) shows that, after applying the weight (0.25) to the normalized efficacy score (0.94737), the weighted and normalized efficacy score for surgery is 0.23684. This table allows for a systematic comparison of the treatment options, considering both the importance of each criterion (as indicated by the weight) and their respective performance. It helps in identifying the treatment option that provides the best overall balance across all criteria, considering efficacy, survival rate, side effects, pain management, cosmetic outcomes, cost, and time to recovery in a weighted manner.

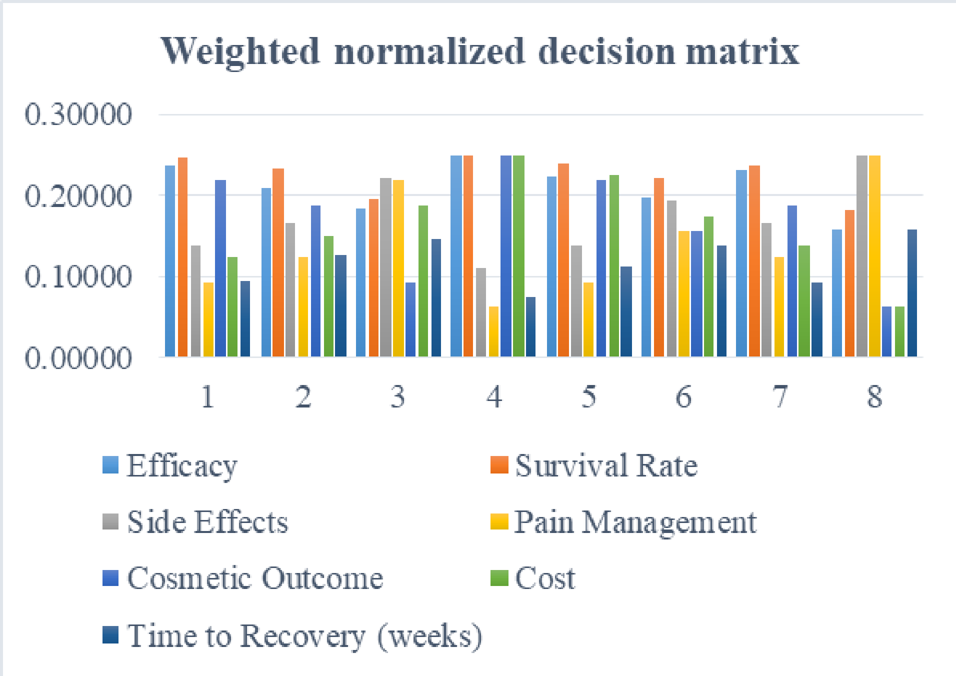

FIGURE 2. Weighted normalized decision matrix

The image labeled as 3 Weighted Normalized Decision Matrix" presents a tabular representation. It reveals that among the evaluated criteria, surgery stands out with the highest normalized scores for survival rate, efficacy, and pain management. However, it also receives the highest normalized scores for cost and time to recovery. Medication leads in terms of cosmetic outcome and side effects. Conversely, natural remedies receive the lowest normalized scores across all criteria. In summary, this weighted normalized decision matrix suggests that surgery excels in survival rate, efficacy, and pain management, yet comes at a higher cost and longer recovery time. Medication outperforms in cosmetic outcome and side effects. On the other hand, natural remedies are the most cost-effective with the shortest recovery time but lag behind in terms of effectiveness when compared to surgery or medication. The choice of treatment depends on individual priorities and circumstances. Those prioritizing survival rate and efficacy may lean toward surgery, while cost and recovery time-conscious individuals may opt for medication. Those concerned about side effects may favor natural remedies. It's essential to consider personal priorities, circumstances, and preferences when making the decision, as the weighted normalized decision matrix is just one tool in the decision-making process.

Table 5 the "Preference Score & Rank" table, provides a comprehensive assessment of the skin cancer treatment options based on the weighted and normalized criteria. The "Preference Score" represents a composite score for each treatment option, reflecting its overall performance considering the assigned weights for each criterion. Higher preference scores indicate that a treatment option performs better across the criteria. The "Rank" column ranks these treatment options based on their preference scores, with "1" being the highest-ranked option. In this case, "Targeted Therapy" received the highest rank (1.25150), indicating that it is the most preferred choice, while "Herbal Remedies" received the lowest rank (1.12308), making it the least preferred option. This table assists decision-makers in identifying the optimal skin cancer treatment option that aligns with their specific priorities and criteria, based on the weighted evaluation data provided earlier.

TABLE 5. Preference Score and Ranking

Treatment	Preference Score	Rank
Surgery	1.15536	7
Radiation Therapy	1.20038	5
Chemotherapy	1.24911	2
Immunotherapy	1.24861	3
Targeted Therapy	1.25150	1
Photodynamic Therapy	1.23882	4
Cryotherapy	1.17786	6
Herbal Remedies	1.12308	8

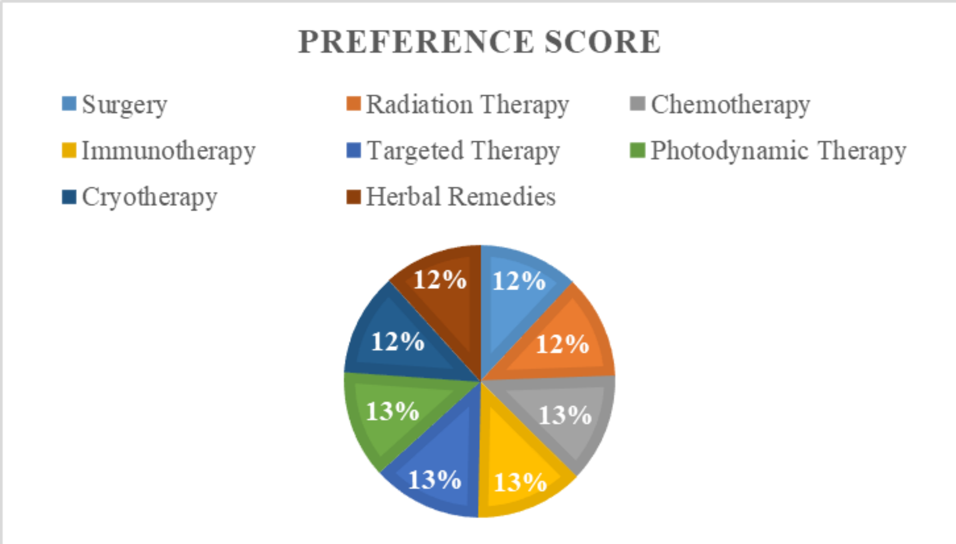

FIGURE 3. Preference Score

The pie chart depicts the preference scores associated with various cancer treatment options. It illustrates that each treatment type holds an equal preference score, standing at 12%. This implies that there isn't a discernible preference among patients for any specific cancer treatment. It's vital to acknowledge that this represents just a momentary glimpse of preference scores for cancer treatment. The actual scores can fluctuate based on several variables, including the cancer type, patient age, health status, and the availability of treatment options. The pie chart serves as a valuable tool for visualizing preference scores across different cancer treatments. Nevertheless, it's crucial to interpret the data thoughtfully and consider all the factors influencing the decision-making process regarding the choice of treatment.

The figure4 rank shows the indicates that surgery holds the top position in terms of ranking, followed by radiation therapy, chemotherapy, and immunotherapy. In contrast, targeted therapy, photodynamic therapy, cryotherapy, and herbal remedies receive lower rankings. These rankings are determined by considering various factors, including the therapy's effectiveness, its associated side effects, and its cost. It's crucial to emphasize that these rankings serve as a broad reference. The most suitable therapy for an individual patient will hinge on their unique circumstances and needs.

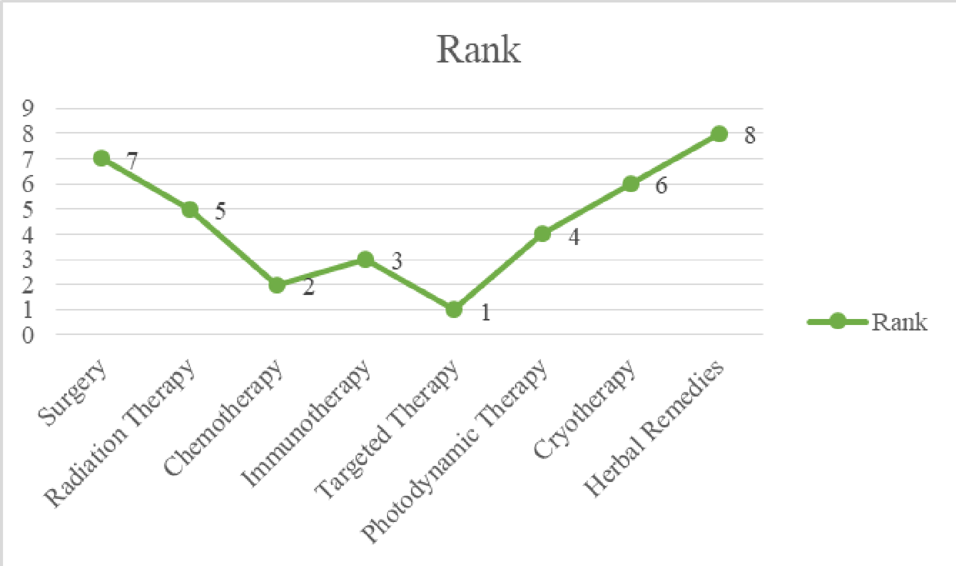

FIGURE 4. Rank

4. CONCLUSION

Skin cancer is a serious and potentially life-threatening medical condition that arises when the cells in the skin begin to grow uncontrollably. It is one of the most common types of cancer globally, and its prevalence has been steadily increasing over the years. To fully appreciate the significance of skin cancer, it is essential to understand its types, causes, risk factors, prevention, and early detection methods. There are three primary types of skin cancer: basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma. BCC and SCC are more common and often less aggressive, while melanoma is rarer but more aggressive and prone to metastasis. Ultraviolet (UV) radiation from the sun and artificial sources like tanning beds is a major risk factor for all types of skin cancer. Other risk factors include a family history of skin cancer, fair skin, a large number of moles, and a weakened immune system. Preventing skin cancer is crucial, and the most effective way to do so is by minimizing exposure to UV radiation. This can be achieved by seeking shade, wearing protective clothing, including wide-brimmed hats and sunglasses, and using sunscreen with a high SPF rating. Additionally, avoiding tanning beds and sunbathing can significantly reduce the risk of skin cancer. Early detection is key to successfully treating skin cancer. Regular self-examinations of the skin can help identify suspicious moles or lesions. The ABCDE rule is a useful tool for recognizing potential melanomas: A for asymmetry, B for border irregularity, C for color variation, D for diameter larger than a pencil eraser, and E for evolving changes. Any suspicious skin changes should be promptly evaluated by a dermatologist. Skin cancer is diagnosed through various methods, including skin biopsies, and treatment options depend on the type, size, and stage of the cancer. Treatment may involve surgical excision, radiation therapy, topical treatments, or immunotherapy. When detected early, the prognosis for most skin cancers is excellent, with a high likelihood of complete cure. skin cancer is a significant health concern with rising global incidence rates. Its prevention and early detection are paramount in reducing its impact. Understanding risk factors, adopting protective measures, and regularly examining one's skin can greatly reduce the risk of developing skin cancer. If diagnosed, prompt medical attention and appropriate treatment can lead to successful outcomes and, in many cases, complete recovery. Education and awareness campaigns play a vital role in promoting sun-safe behaviors and fostering a culture of vigilant skin care to combat this widespread and potentially deadly disease.

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