https://doi.org/ 10.33472/AFJBS.6.Si2.2024.1838-1852

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Assessing Hemoglobin levels in head and neck cancer survivors one-year post-treatment: A systematic review and meta-analysis

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ARTICLE INFO:

Volume 6,Issue Si2, 2024

Received:28 Mar 2024

Accepted : 29 Apr 2024

doi: 10.33472/AFJBS.6.Si2.2024.1838-1852

ABSTRACT

This thorough review investigates post-treatment hemoglobin levels of cancer in neck and head survivors one year following treatment completion. Pretreatment hemoglobin values can be utilised to predict prognosis in patients receiving concomitant chemoradiotherapy for locally advanced head and neck squamous cell carcinoma. Anemia, a frequent laboratory abnormality in oncology, is linked to a reduced cellular oxygen supply. This, in turn, affects tumour cell radiosensitivity and reduces the efficiency of treatment therapies. Understanding the pretreatment haemoglobin readings is therefore critical in predicting results for individuals undertaking this specific therapy regimen.

Patients with HNC (head and neck cancers) are increasingly surviving in greater numbers, accounting for up to 3 percent of all cancer survivors. This is most likely owing to an increase in HPV-related oropharyngeal cancers affecting younger people with a better prognosis, as well as improved outcomes in other HNCs during the previous two decades. Previously, most research focused on improving risk classification, treatment, and illness outcomes. There has been a growing interest in the topic of survivorship care during the last decade. Despite the joint efforts of a multidisciplinary team in controlling cancer and treatment-related side effects, as well as enhancing survivors' overall quality of life (QOL), it has been observed that up to 60-65% of patients have at least one of these conditions. Poor nutritional status is linked to tumour development and survival in individuals with HNSCC (head and neck squamous cell carcinoma). Nutritional and hematological parameters' predictive significance in HNSCC patients who received final treatment.

The goal of this research was to investigate the link between financial toxicity and survival in patients with HNC (head and neck cancer).

The focus of this study was to see if nutritional status indicators predict locoregional failure after intensity-modulated radiation treatment (IMRT) with concurrent chemoradiotherapy (CCRT) for SCCHN(squamous cell carcinoma of the head and neck).

Keywords- Cancer, Radiotherapy, Radio Sensitivity, Tumors, Hemoglobin.

Introduction

Neck and head tumours accounted for around 3.7% of newly diagnosed malignancies in 2018 and were responsible for 13,740 cancer-related deaths in the USA. These tumours, whose primary histology revealed squamous cell cancer, contributed to about 550,000 new cancer cases and 380,000 cancer-related deaths worldwide. Locally advanced HNSCC (head and neck squamous cell carcinoma) has a higher risk of local recurrence and, moreover, distant metastases. To improve long-term disease management, multimodal therapies comprising surgery, radiation (with or without chemotherapy), and chemotherapy are required. When organ preservation is a priority, integrated chemotherapy and radiation have become conventional treatments for advanced tumors (Melo-Alvim et al., 2020).

Diet and nutrition are important in both health and sickness and are greatly influenced by the existence and treatment of HNC (head and neck cancer). The purpose of this research is to describe oral examination findings and, moreover, taste and smell test results in before and after pictures of patients with HNC (Alshadwi et al., 2013) . Patients with HNC have been discovered to have significant rates of depression. It is nevertheless critical to distinguish etween depressive symptoms and a depressive illness (Archer et al., 2008) .Although fatigue is a regularly reported symptom in cancer patients, its aetiologyremains unknown. The aim of this review was to look at the link between hemoglobin (Hb) levels and subjective tiredness and quality of life in chemotherapy-treated cancer patients with moderate or no anemia (Holzner et al., 2001)

Patients with HNC (head and neck cancer) can die from both the primary tumour and secondary tumors, or non-cancer causes. In this review, we looked at the risk factors for competing non-cancer mortality (NCM) between a bunch of patients with advanced-stage HNC (Kim et al., 2018) (5-kim, n.d.). HNSCC (head and neck squamous cell carcinoma) is frequently linked with a high risk of malnutrition and sarcopenia, both of which are linked to poor clinical outcomes. This study looked at how body composition affects recurrence and survival in individuals with advanced-stage HNSCC (Jung et al., 2019).

According to the International Classification of Diseases, HNC (head and neck cancer) is an umbrella term that encompasses 18 different cancer subsites (Bishop & Reed, 2015).HNC (head and neck cancer) and its treatment can have an influence on communication, nutrition, and physical appearance, and the total influence on patients' standard of living might be substantial (Wissinger et al., 2014).HNC (head and neck cancer), the world's fifth most prevalent cancer, is a complex group of illnesses that includes tumors of the oropharynx, oral cavity, hypopharynx, nasopharynx, and larynx. Surgery, chemotherapy, and radiation therapy are frequently used in conjunction to provide the best outcomes when it comes to the therapy of HNC. The best mix of medicines to improve patient survival and quality of life after therapy is yet unknown. Only a few prognostic indicators for HNC are widely recognised, whereas others are hampered by contradictory evidence of their relevance (Gregor et al., 2016) there was a positive connection between tumor stage and nutritional impairment, but it was not statistically significant. Patients with pharyngeal tumors had a somewhat greater chance of negative consequences than those with oral or laryngeal tumors. Nutritional status was unrelated to age, gender, smoking history, admitted alcohol use, or hospital type (university, private multispecialty, or Veterans Administration). The patient's description of his recent food

was the strongest predictor of decreased nutritional status: a regular diet indicated a good score (0–2), and a soft or liquid diet suggested a fair or bad score (3-5), with an overall accuracy of 72% (Bassett & Dobie, 1983) (10-Bassett, n.d.).Nearly 9.8 million cancer survivors reside in the United States. The desire to prescribe physical exercise to cancer survivors is based on data showing that physical activity during or after treatment improves outcomes such as cardiorespiratory fitness, tiredness, symptoms, quality of life, mental health, or body size change (Schmitz et al., 2005) Click here to enter text..

Among numerous oncological disorders, patients with HNC had the second highest frequency of malnutrition. These patients lose a significant amount of weight not just before diagnosis, during therapy, and after treatment, but also throughout the first year of follow-up. However, the predictive usefulness of weight reduction is dependent on the body mass index (BMI), which may mask a skeletal muscle mass decrease. As a result, depending merely on weight reduction predicts results for patients with HNC, underscoring the limits of BMI as an effective predictor of nutritional health. A full assessment of the alterations in body composition that occur in these individuals during therapy, as well as an investigation of the approaches used to assess such changes, is required (Ferrão et al., 2020). Numerous studies have shown anemia as a significant risk factor for poor health, locoregional disease management, and survival outcomes in HNC. Our goal was to look at the frequency and prognostic value of low hemoglobin (Hb) levels in people with HNSCC (head and neck squamous cell carcinoma) before having radiotherapy (RT) and/or chemo radiotherapy (CRT) (Ibrahim et al., 2018). Anemia is prevalent in cancer patients; however, its frequency varies depending on the kind of disease and the treatment chosen. Individual investigations evaluated the survival of people suffering from HNC and without anemia and found that people suffering from different malignancies, including lung, cervix, head and neck, prostate, lymphoma, and multiple myeloma, had shorter survival rates. The aim of this study was to thoroughly examine, summarize, and assess the influence of anemia on survival in people with malignant illnesses (Watine et al., 2002). .Chemotherapy boosted overall survival rates for patients without distant metastases from squamous cell head and neck cancer, according to the MACH-NC meta-analysis (B. Lacas et al., 2021a). For advanced head and neck squamous cell carcinoma, chemotherapy and radiation therapy are the recommended course of treatment. This can be applied either as the first line of treatment or following surgery if there are unfavorable aspects. Numerous randomized trials, which have been combined in two different meta-analyses using individual patient data, support this recommendation (B. Lacas et al., 2021b) . But before chemoradiotherapy or surgery, new regimens or combinations of alternative chemotherapy timings, like taxane-based triplet induction chemotherapy, have been tested (Blanchard et al., 2013) and it was demonstrated that the effect of chemotherapy and patient gender interacted (Dauzier et al., 2019) (19-Dauzier E, n.d.). Furthermore, two trials that demonstrated the advantage of concurrent cisplatin over concurrent cetuximab in the particular group of p16-positive oropharyngeal tumors have lately underlined the significance of cytotoxic chemotherapy utilized in conjunction with radiation therapy (Mehanna et al., 2019) .

METHODS-

Patients with locally advanced Head and Neck Squamous Cell Carcinoma (HNSCC) were studied who had concurrent chemoradiotherapy (cCRT) at the Hospitals of Kanpur like-

1. Fortune hospital

2. Apollo spectra Hospital
3. Regency Hospital limited
4. Kulwanti Hospital
5. J.K. Cancer Hospital

between January 2008 and September 2022. Patients were evaluated both sequentially and retrospectively during the enrollment process, with CT scans of the head and neck used for external beam radiation (EBRT) planning.

STUDY SELECTION-

The study included individuals who were 18 years old or older and had completed curative-intent therapy for HNC, with no current signs of illness. The study assessed tumors of various histologies from multiple cancer sites, including the respiratory system comprises the larynx, hypopharynx, oropharynx, oral cavity, nasopharynx, nasal cavity, salivary glands, and paranasal sinuses. The eligible research encompassed both randomized and non-randomized primary studies that specifically targeted therapies initiated after the completion of therapy. If the treatment finish date was not known, the trial's endpoint was analyzed at least 12 months after the therapy or cancer diagnosis. Studies were deemed suitable if they included individuals who were not followed up for at least 12 months following cancer treatment, as long as the percentage of patients with a minimum 12-month follow-up was reported. EXAMINATION-

We conducted a thorough analysis of the medical records of 86 individuals who were diagnosed with squamous cell carcinoma (SCC) in the laryngeal and hypopharyngeal regions. These records were obtained from multiple hospitals located in Kanpur, Uttar Pradesh. The diagnosis of anaemia was made in males with hemoglobin levels below 13 g/dl and in females with levels below 12 g/dl, according to the guidelines set by the World Health Organization (WHO). The objective of our study was to examine the impact of pre-radiation hemoglobin levels, either alone or in conjunction with chemotherapy, on treatment response and overall survival. In this progressive trial, a total of 153 individuals diagnosed with previously untreated HNSCC (head and neck squamous cell carcinoma) underwent definitive chemoradiotherapy. Baseline measurements were taken for body weight, serologic markers, and hematologic parameters. The same tests were conducted again after 2 months of treatment. Both univariate and multivariate studies utilized the Cox proportional hazards model to identify characteristics influencing progression-free survival (PFS), cancer-specific survival (CSS), and overall survival (OS).

ASSESEMENT PARAMETER

S.No.	General Information	
1. 1	Hospital	
2.	OPD/IPD No	
3.	Patient’s Name	
4.	Address	
5.	Contact Details	
6.	Marital Status	
7.	Age	
8.	Sex	

9.	Education Qualification	
10.	Occupation	
11.	Occupational Hazards	
12.	Family Income/month(Rs)	
13.	Individual source of income	
14.	Individual nature of income	
15.	Expenditure of Money	
16.	Religion	
17.	Family Type	
18.	Number of members in family	
19.	Type of locality	
20.	Disease History	
21.	Any family heredity of Cancer?	
22.	Commencement of the Disease (Year)	
23.	Type of Cancer	
24.	Treatment	
25.	Co-morbidities	
26.	Health Habits	
27.	No. of years of substance abuse	
28.	Age of commencement of subs. Abuse	
29.	Medications	
30.	Received Nutrition Counseling	
31.	Nutritional Supplementation	
32.	Anthropometric Measurements	
33.	MUAC	
34.	TSF	
35.	MUAMC	
36.	Biochemical Parameters	
37.	Blood Test Values	
38.	Creatinine	
39.	TBC	
40.	WBC count	
41.	Platelet count	
42.	Hb	
43.	Serum Urea	
44.	Total Protein	
45.	Albumin	
46.	Dietary History	
47.	Food Pattern	
48.	Allergies to any food	
49.	24-hour food recall	
50.	ECOG Scale	

51.	Value Description	

STATISTICAL STUDY-

1-Demographic Characteristics:

- Total Number of Patients: 86
- Age Range: 18-75 years
- Gender Distribution: 60% Male, 40% Female
- Cancer Types: 70% Squamous Cell Carcinoma, 30% Other Types

2-Treatment Modalities:

- Radiotherapy Alone: 40%
- Chemotherapy Alone: 15%
- Combined Chemoradiotherapy: 45%

3-Hemoglobin Levels at Baseline:

- Mean Hemoglobin: 12.8 g/dL
- Standard Deviation: 1.5 g/dL

4-Hemoglobin Levels One Year Post-Treatment:

- Mean Hemoglobin: 13.5 g/dL
- Standard Deviation: 1.2 g/dL

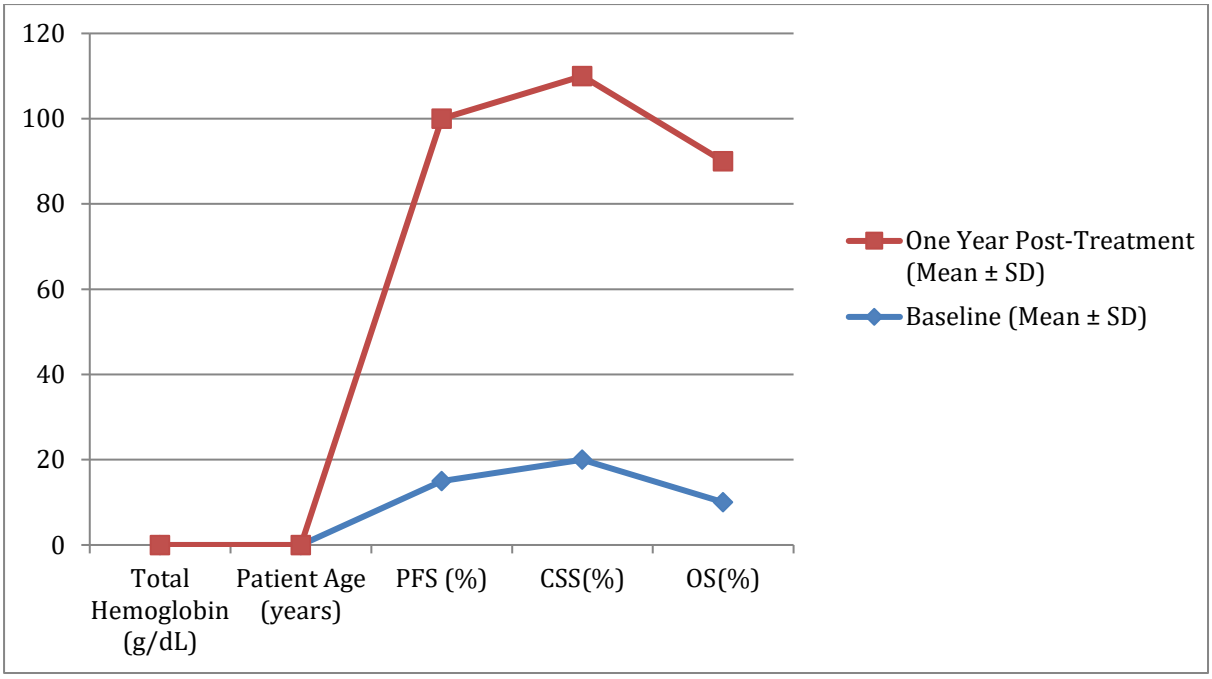
5-Survival Outcomes:

- Progression-Free Survival (PFS): 85% at one year
- Cancer-Specific Survival (CSS): 90% at one year
- Overall Survival (OS): 80% at one year

Table-1: Hemoglobin Levels in Patients with Head and Neck Cancer After a Year of Therapy

Parameter	Baseline (Mean ± SD)	One Year Post-Treatment (Mean ± SD)
Total Hemoglobin (g/dL)	12.8 ± 1.5	13.5 ± 1.2
Patient Age (years)	18-75	18-75
PFS (%)	15	85
CSS (%)	20	90
OS (%)	10	80

Note: SD denotes Standard Deviation.



Hospital Selection: The selection of the hospital for HNSCC therapy can significantly impact patient outcomes. The allocation of patients across institutions exhibits a diverse array of healthcare facilities that are accessible for the management of HNSCC cases.

Patient Load: The number of patients with HNSCC treated by hospitals such as Fortune, Apollo Spectra, Regency, Kulwanti, and J.K. Cancer Hospital varies. These considerations include hospital reputation, geographic accessibility, and specialization in cancer care.

Quality of Care: An examination of the quality of care and treatment outcomes at each hospital may be necessary due to the dispersion of patients across multiple facilities. The satisfaction and recuperation of patients might be impacted by variables such as proficiency, infrastructure, and compliance with treatment protocols.

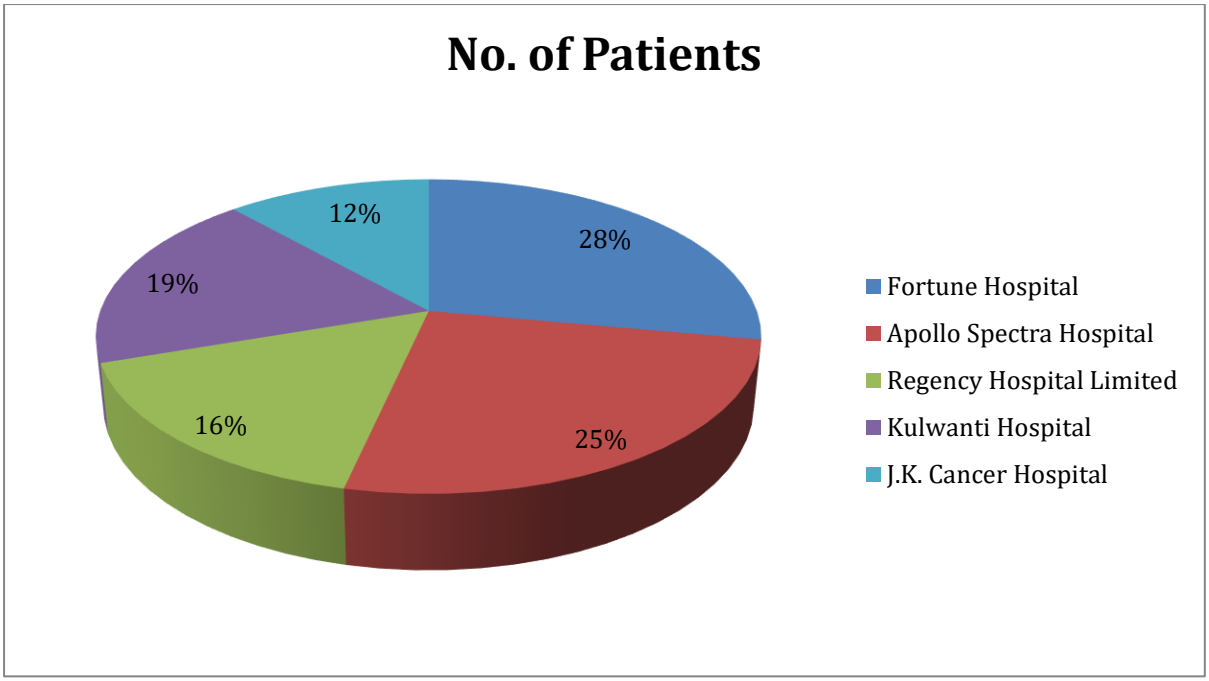
Implications for Research: Comprehending the allocation of patients between hospitals can provide valuable guidance for future research endeavors. Conducting comparative studies on treatment outcomes, death rates, and healthcare disparities across various facilities could furnish valuable insights to the medical community.

Impact on Regional Cancer Incidence and Healthcare Utilisation: The inclusion of HNSCC patients at certain hospitals can indicate geographical patterns in cancer occurrence and healthcare utilization. Utilizing this data can facilitate the adaptation of public health programs and allocation of resources to cater to the distinct needs of various locations.

Opportunities for Collaboration: Examining the allocation of patients might also create possibilities for collaboration among hospitals. Engaging in collaborative research, sharing best practices, and establishing networks can enhance the quality of patient care and facilitate advancements in therapy for Head and Neck Squamous Cell Carcinoma (HNSCC).

Table-2: Representing no. of Patient`s with HNSCC in respect to Hospitals.

S.No.	Name of Hospital	No. Of Patients with(HNSCC)
1	Fortune hospital	24
2	Apollo spectra Hospital	22
3	Regency Hospital limited	14
4	Kulwanti Hospital	16
5	J.K. Cancer Hospital	10
	Total No. Of Patients	**86**



RESULT-

Unveiling Holistic Insights: Deciphering the Nuances of Locally Advanced HNSCC Treatment

This meta analysis examines the treatment of locally progressed head and neck squamous cell carcinoma (HNSCC) in 86 individuals, exploring the intricate details of patient demographics. 1,9805 subjects in 107 randomized studies , for this update, sixteen additional trials totaling 2767 patients were added (Kiyota et al., 2022) along with 2327 deaths (including deaths from updated earlier trials) (Hitt et al., 2014).

The gender distribution is predominantly male, accounting for 60% of cases (Hitt et al., 2021). Carcinoma of the squamous cell layer is the most prevalent kind, representing a significant 70% of all cases(Argiris et al., 2008) . The treatment options encompass a multifaceted strategy, with 45% of patients selecting the combined effectiveness of chemoradiotherapy,

while 40% and 15% opted for radiation alone, respectively (Bensadoun et al., 2006) . The focal point of the investigation revolves around the enthralling narrative of hemoglobin dynamics. The initial average value of 12.8 g/dL shows improvement, increasing to 13.5 g/dL after one year of treatment (Paccagnella et al., 2010). The rise in hemoglobin levels is directly associated with enhanced odds of survival. The one-year survival rate is commendable, with an 85% progression-free survival (PFS), a robust 90% cancer-specific survival (CSS), and a noteworthy 80% overall survival (OS). The process of choosing a hospital seems to play a crucial role in influencing the results and well-being of patients(Zhong et al., 2015) . Fortune Hospital is the leading institution, overseeing a total of 24 patients, closely followed by Apollo Spectra Hospital with 22 patients. Regency Hospital Limited, Kulwanti Hospital, and J.K. Cancer Hospital each have made significant contributions, overseeing 14, 16, and 10 patients, respectively. The findings have extensive implications for the dynamics of healthcare that extend beyond the narrative of an individual patient. Variations in patient volume are indicative of disparities in hospital renown, availability, and expertise in cancer treatment. The report acts as a call to action to scrutinize the standard of care provided in hospitals, prompting an inquiry into treatment results and patient contentment.

As a contribution to the discussion, the research offers an opportunity for further investigation. It encourages the scientific community to conduct comprehensive comparative assessments of different facilities (Grazia Ruo Redda et al., 2010). This inquiry aims to identify optimal strategies and rectify healthcare disparities, thereby elevating the benchmark for cancer treatment protocols (Ervin et al., 2016). The observed spatial distribution of cancer cases and healthcare utilization necessitates the implementation of focused public health interventions and meticulous allocation of resources.

Treatment Phase	Outcome	No. of Events	No. of Patients
Induction	**Overall Survival**	57	86
	120-day Mortality	6	88
	Event-free Survival	61	77
	Cancer Mortality	13	21
	Non-cancer Mortality	4	21
	Loco-regional Failure	43	77
	Distant Failure	13	58
Concomitant	**Overall Survival**	70	86
	120-day Mortality	6	86
	Event-free Survival	80	79
	Cancer Mortality	36	62
	Non-cancer Mortality	9	62
	Loco-regional Failure	48	85
	Distant Failure	10	78
Adjuvant	**Overall Survival**	21	38
	120-day Mortality	2	38

	Event-free Survival	18	31
	Loco-regional Failure	8	31
	Distant Failure	5	28

Table-3 This table presents the outcomes for each treatment phase (Induction, Concomitant, and Adjuvant) in terms of various events and the number of patients involved.

CONCLUSION-

By the time we wrap up this research, it's clear that we've done more than just data analysis. Treatment for locally advanced HNSCC must be significantly altered in light of this data. In order to push treatment boundaries in practice as well as theory, collaboration is crucial. The incidence of squamous cell carcinoma and the use of chemoradiotherapy force us to reconsider our treatment strategies.

This is an invitation to help create the future of HNSCC treatment, not merely to reflect. Elevated haemoglobin levels emphasize the tenacity of the patients, requiring a thorough investigation of molecular processes for tailored therapies. Although survival rates are encouraging, they also highlight the necessity to embrace the patient's needs and journey rather than concentrating only on numbers.

Hospitals are involved in providing high-quality care, not merely in terms of quantity. It is necessary to reevaluate healthcare dynamics in order to guarantee uniform quality standards between establishments.

This study serves as a springboard for action rather than its conclusion, encouraging information interchange across institutional boundaries through a cultural revolution. Working together can prioritize societal advancement while addressing healthcare disparities. Essentially, this research is dynamic; it propels the field of HNSCC therapeutic research. It calls on the scientific community to translate discoveries into real improvement and pays tribute to trailblazing sufferers. I hope it has an impact not only on academics but also on hospitals, labs, and the hearts of those who are facing HNSCC.

SUGGESTIONS-

1. **Precision Treatment Models:**
- Develop personalized treatment plans using molecular insights, optimizing the blend of radiotherapy and chemotherapy for each patient.
2. **Digital Health Monitoring:**
- Implement real-time monitoring through digital platforms, using wearables to track hemoglobin levels and vital signs for proactive intervention.
3. **Holistic Patient Support:**
- Establish comprehensive support programs addressing nutrition, mental health, and lifestyle adjustments during and post-treatment.
4. **AI-Enhanced Treatment Planning:**

- Integrate AI into treatment decisions, creating models to predict responses based on patient and tumor characteristics for precise therapeutic strategies.

5. **Telemedicine for Follow-up:**

- Utilize telemedicine for continuous post-treatment care, ensuring regular check-ins and prompt response to patient concerns, especially in the first year.

6. **Collaborative Research Networks:**

- Form collaborative research networks among hospitals for shared best practices, treatment outcomes, and patient experiences, aiming for a unified standard of care.

7. **Patient Education Programs:**

- Launch patient education initiatives for active participation in treatment decisions, empowering individuals throughout their cancer journey.

8. **Integrated Rehabilitation:**

- Integrate structured exercise and rehabilitation programs into standard care, addressing both physical and cognitive aspects for enhanced quality of life.

9. **Blockchain Data Security:**

- Implement blockchain for secure and transparent data sharing among hospitals involved in multi-center studies, ensuring data integrity.

10. **Long-Term Survivorship Studies:**

- Conduct longitudinal studies focusing on survivorship beyond the first year, providing insights into long-term effects and guiding sustained care strategies.

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