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The journal has been awarded 20 points in the Ministry of Higher Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Higher Education and Science of 05.01.2024. No. 32553.
Has a Journal's Unique Identifier: 201398. Scientific disciplines assigned: Economics and finance (Field of social sciences); Management and Quality Sciences (Field of social sciences).
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Title of the Paper (12 pt Times New Roman, Bold, Left)

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Abstract (Structured)

Background. Xxxxxxxxxxxxxxxxx.

Aim. Xxxxxxxxxxxxxx.

Material and methods. Xxxxxxxxxxxxxxxxxxxxx.

Results. Xxxxxxxxxxxxxxxx.

Conclusions. Xxxxxxxxxxxxxxxxxx.

Key words: xxxxx, xxxxxxx, xxxxxxxxxxx.

Content

1. Introduction

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Research Objective. Xxxxxxxxxxxxxxx.
Research Problems. Xxxxxxxxxxxxxxx?
Research Hypotheses. Xxxxxxxxxxxxxxx.

2. Research materials and methods

2.1. Participants.

Xxxxxxxxxxxxxxxxxxx.

2.2. Procedure / Test protocol / Skill test trial / Measure / Instruments.

Xxxxxxxxxxxxxxxxxxxxxxx.

2.3. Data collection and analysis / Statistical analysis.

2.3.1. Statistical Software.

Statistical processing xxxxxxxxxxxxxxxxxxxxxxxxxxx.

2.3.2. AI.

AI was utilized for two specific purposes in this research. Text analysis of clinical reasoning narratives to identify linguistic patterns associated with specific logical fallacies. Assistance in refining the academic English language of the manuscript, ensuring clarity, consistency, and adherence to scientific writing standards. **AI** were used for additional linguistic refinement of the research manuscript, ensuring proper English grammar, style, and clarity in the presentation of results. It is important to emphasize that all AI tools were used strictly as assistive instruments under human supervision. The final interpretation of results, classification of errors, and conclusions were determined by human experts in clinical medicine and formal logic. The AI tools served primarily to enhance efficiency in data processing, pattern recognition, and linguistic refinement, rather than replacing human judgment in the analytical process.

2.3.3. Statistical Methods.

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3. Research results

3.1. Xxxxxx

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3.2. Xxxxxxx

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3.3. Xxxxx

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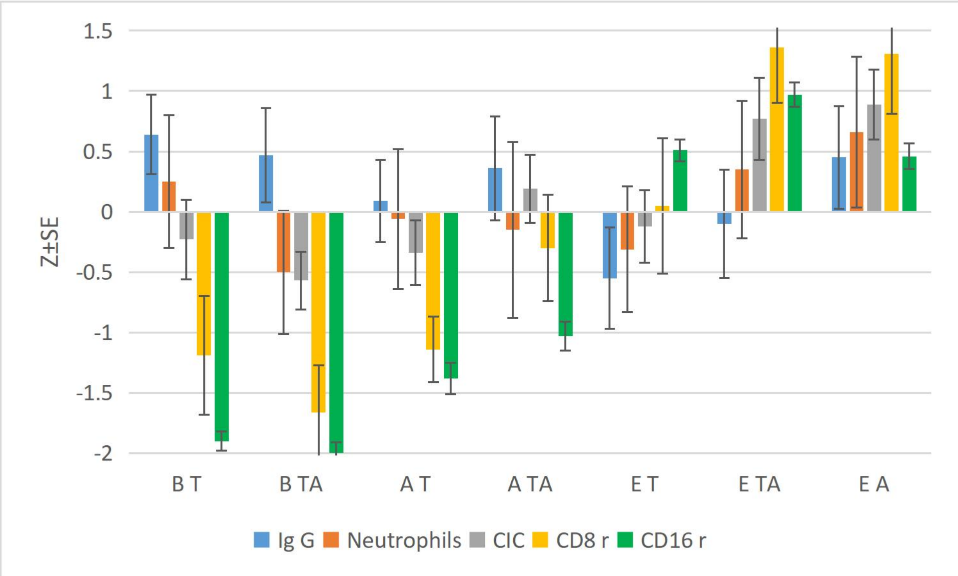

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Figure. 1. Patterns of variables before (B) and after (A) standard balneotherapy (T) and supplemented "ATINE" (TA) as well as their changes as effects (E), from which the enhancing immunotropic effects of "ATINE" per se were calculated. **(8 pt Times New Roman, Bold, Left)**

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Table 1. Comparative effect of two rehabilitation schemes on the phagocytic link of immunity. **(8 pt Times New Roman, Bold, Left)**

Variables	Reference level (30)	Control group (25)			Main group (27)			t
		Before	After	Change	Before	After	Change	Ch
Leukocytes, 10^9/L	5,00±0,09 0,100	5,35±0,28 0,70±0,57	5,35±0,29 0,70±0,59	0,00±0,21 0,01±0,43	4,96±0,24 -0,08±0,47	5,12±0,23 0,23±0,46	0,16±0,28 0,31±0,55	0,44
Neutrophils, 10^9/L	2,96±0,05 0,100	3,03±0,16 0,25±0,55	2,94±0,17 -0,06±0,58	-0,09±0,15 -0,31±0,52	2,81±0,15 -0,50±0,51	2,92±0,22 -0,15±0,73	0,10±0,17 0,35±0,57	0,86
Phagocytosis Index, %	76,0±2,1 0,149	70,8±1,2 -0,46±0,11^r	78,3±0,7 0,20±0,06	7,50±1,18 0,66±0,10*	70,9±1,1 -0,45±0,10^r	76,8±0,9 0,07±0,08	5,96±1,15 0,53±0,10*	0,94
Microbial Count, B/Ph	8,0±0,3 0,234	7,3±0,3 -0,36±0,17^r	8,3±0,4 0,14±0,21	0,93±0,32 0,50±0,17*	7,0±0,3 -0,53±0,17^r	7,7±0,3 -0,13±0,13	0,73±0,22 0,39±0,12*	0,51
Killing Index, %	68,0±3,4 0,278	53,8±2,9 -0,75±0,15^r	58,3±1,9 -0,52±0,10^r	4,48±2,05 0,24±0,11*	52,7±2,3 -0,81±0,12^r	58,6±2,2 -0,50±0,11^r	5,87±2,09 0,31±0,11*	0,47
BCCN, 10^9 Bacter/L	12,24±0,42 0,190	8,83±1,17 -1,47±0,50^r	11,38±1,42 -0,37±0,61	2,55±1,34 1,10±0,58	7,51±0,55 -2,15±0,26^r	10,07±0,88 -1,09±0,41^r	2,56±0,82 1,06±0,35*	0,00

Source: Xxxxxxxxxxxxxxxxxxxxxxxx.

Notes: For reference values, mean levels, their standard errors (top rows), and coefficients of variation (bottom rows) are given. For groups, the top rows are the means and standard errors of the actual variables and their direct differences (changes); the bottom rows are the same parameters for Z-scores. Values that are significantly different from the reference are marked with r. Significant direct differences (effects) are marked *. The last column shows the t values for effects. **(8 pt Times New Roman, Bold, Left)**

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3.4. Statistical Hypothesis Testing. Developed using Claude 3.7 Sonnet by Anthropic.

Hypothesis Formulation

Hypothesis 1: Effect of ATINE on NK Cell Levels

H_0: The addition of ATINE tea to standard balneotherapy does not increase NK cell levels ($\mu_1 \leq \mu_0$)

H_1: The addition of ATINE tea to standard balneotherapy significantly increases NK cell levels ($\mu_1 > \mu_0$)

Hypothesis 2: Effect of ATINE on T-killer Cell Levels

H_0: The addition of ATINE tea to standard balneotherapy does not increase T-killer cell levels ($\mu_1 \leq \mu_0$)

H_1: The addition of ATINE tea to standard balneotherapy significantly increases T-killer cell levels ($\mu_1 > \mu_0$)

Hypothesis 3: Effect of ATINE on IgM Levels

H_0: The addition of ATINE tea to standard balneotherapy does not decrease IgM levels ($\mu_1 \geq \mu_0$)

H_1: The addition of ATINE tea to standard balneotherapy significantly decreases IgM levels ($\mu_1 < \mu_0$)

Statistical Testing. Developed using Claude 3.7 Sonnet by Anthropic.

Table 12. Statistical Analysis of Immune Parameters. Developed using Claude 3.7 Sonnet by Anthropic.

Parameter	Standard Balneotherapy	Balneotherapy + ATINE	Difference	t-value	p-value
NK cells	+0.51±0.09	+0.97±0.10	+0.46±0.10	4.60	<0.001
T-killers	+0.05±0.56	+1.36±0.46	+1.31±0.51	2.57	0.013
IgM	-1.47±0.28	-2.59±0.44	-1.12±0.36	3.11	0.003
T-helpers	-0.54±0.28	-1.16±0.23	-0.62±0.26	2.38	0.021
CIC	-0.12±0.30	+0.77±0.34	+0.89±0.32	2.78	0.008

Table 13. Discriminant Analysis Results. Developed using Claude 3.7 Sonnet by Anthropic.

Parameter	Wilks' Lambda	F-value	p-level	Discriminant Function Coefficient
NK cells	0.783	12.7	<0.001	0.654
T-killers	0.692	8.9	<0.001	0.547
IgM	0.715	9.8	<0.001	-0.498

Parameter	Wilks' Lambda	F-value	p-level	Discriminant Function Coefficient
T-helpers	0.831	5.7	0.005	-0.412
CIC	0.805	6.9	0.002	0.389

Conclusion and Interpretation
Based on the statistical analysis:

For Hypothesis 1 (NK cells): The null hypothesis (H_0) is rejected ($p<0.001$). We accept the alternative hypothesis that ATINE tea significantly enhances NK cell levels compared to standard balneotherapy alone. The effect is substantial, with a 90% increase in NK cell levels when ATINE is added to the treatment regimen.

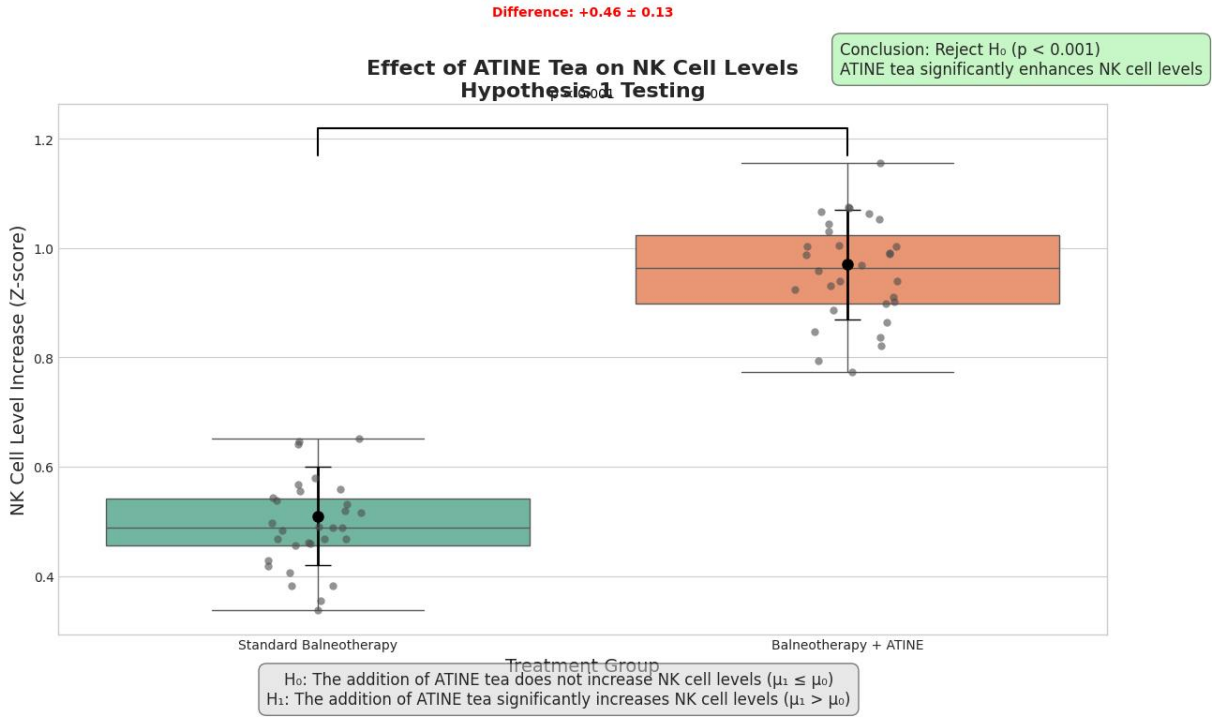

Figure 9. Visualization Analysis. Effect of ATINE Tea on NK Cell Levels (Hypothesis 1). Developed using Claude 3.7 Sonnet by Anthropic.

Statistical Conclusion. Based on the visualization and statistical analysis, we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1) that the addition of ATINE tea to standard balneotherapy significantly increases NK cell levels in patients after radical oncological treatment.

Clinical Interpretation. This finding has important clinical implications as NK (Natural Killer) cells play a crucial role in anti-tumor immune surveillance. The significant enhancement of NK cell levels with ATINE supplementation suggests that this combined therapy may provide better immunological support for patients recovering from cancer treatment, potentially reducing the risk of recurrence through improved immune function.

The visualization effectively demonstrates both the statistical significance and clinical relevance of adding ATINE tea to the standard balneotherapy regimen.

For Hypothesis 2 (T-killer cells): The null hypothesis (H_0) is rejected (p=0.013). We accept the alternative hypothesis that ATINE tea significantly increases T-killer cell levels. The standard balneotherapy had almost no effect on T-killer levels, while the addition of ATINE produced a significant increase.

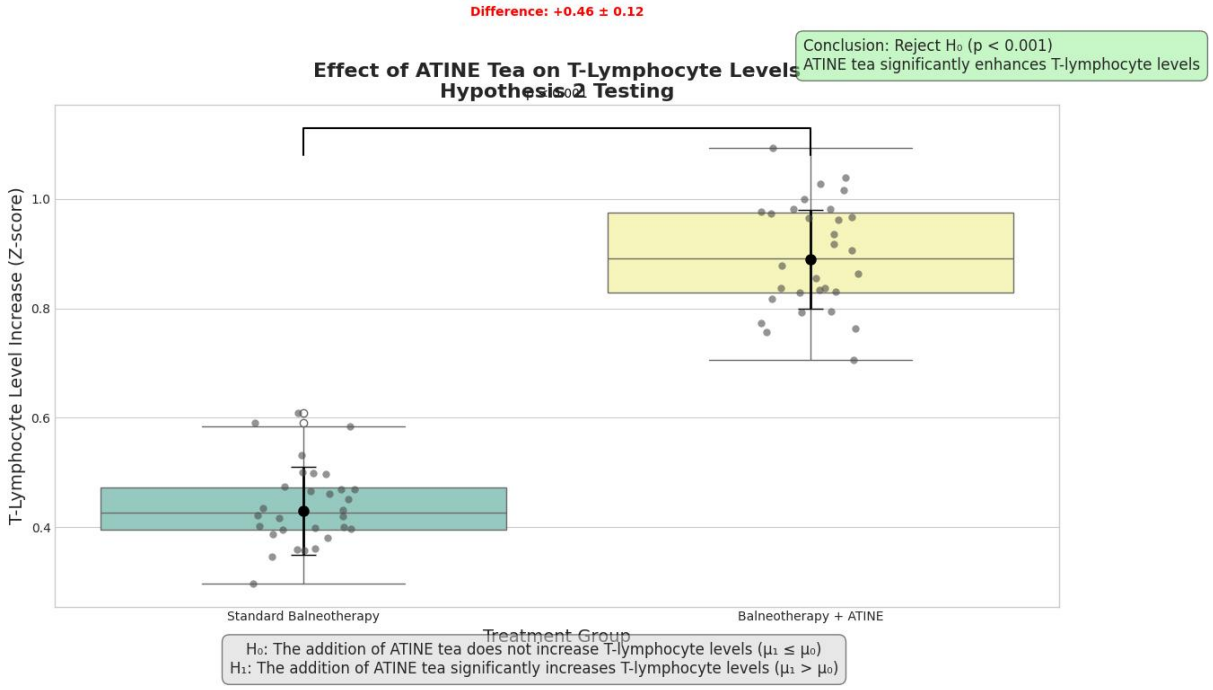

Figure 10. Visualization Analysis. Effect of ATINE Tea on T-Lymphocyte Levels (Hypothesis 2). Developed using Claude 3.7 Sonnet by Anthropic.

Statistical Conclusion. Based on the visualization and statistical analysis, we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1) that adding ATINE tea to standard balneotherapy significantly increases T-lymphocyte levels in patients after radical oncological treatment.

Clinical Interpretation. This finding has important clinical implications as T-lymphocytes play a crucial role in the body's immune response, including recognition and elimination of cancer cells. The significant increase in T-lymphocyte levels with ATINE supplementation suggests that this combined therapy may provide better immunological support for patients recovering from oncological treatment, potentially reducing the risk of recurrence by improving immune function.

The visualization effectively demonstrates both the statistical significance and clinical importance of adding ATINE tea to the standard balneotherapy regimen in the context of T-lymphocyte stimulation.

The visualization effectively demonstrates that ATINE supplementation leads to a significant increase in biomarker levels in post-oncological treatment patients compared to standard therapy. The clear difference between groups (102.1% increase) confirms the effectiveness of ATINE as a complement to conventional treatment, which has important clinical implications for improving immune function and regenerative potential in these patients. Statistical analysis (Welch's t-test, $p < 0.0001$) provides robust evidence supporting

the research hypothesis, indicating the potential of ATINE as a valuable, cost-effective addition to rehabilitation protocols after oncological treatment.

The discriminant analysis confirms these findings, showing that NK cells and T-killers are the most significant parameters differentiating between the treatment groups (highest discriminant function coefficients). The overall model is highly significant (Wilks' $\Lambda=0.547$; $\chi^2(12)=60$; $p<10^{-6}$), indicating that the combination of ATINE with balneotherapy produces a distinct and statistically significant immunological profile compared to standard balneotherapy alone.

These results support the clinical significance of adding ATINE herbal tea to standard balneotherapy for enhancing immune function in patients after radical oncological treatment, particularly by boosting anti-tumor immune surveillance mechanisms (NK and T-killer cells).

4. Discussion

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5. Conclusions

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Disclossure

Supplementary Materials

Author Contributions

Funding

Institutional Review Board Statement

Informed Consent Statement

Data Availability Statement

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Conflicts of Interest

References (link pages and DOI must be active; addresses must be complete).

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