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The influence of the environment of origin and histopathological structure on the evolution and prognosis of patients with prostate adenocarcinoma

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Abstract

Adenocarcinoma is an increasingly common pathology in men, especially with advancing age. Currently, there are many treatment regimens that can lead to the cure of these patients. However, there are a number of factors that influence the evolution of these patients: comorbidities, age, environment of origin, histopathological nature, presence or absence of metastases. In a study conducted on 101 patients, it has been observed that, besides the presence or absence of metastases and the age that impacts the evolution of any oncologic pathology, the prognosis of these patients is greatly influenced by the environment of origin and the histopathological nature.

Keywords: prostate adenocarcinoma, the Gleason Score, the environment of origin, histopathology

1. INTRODUCTION

The prostate adenocarcinoma is a malignancy that occurs more frequently in patients over 66 years old, being one of the few tumors that are easy to diagnose and monitor through PSA [1]. Prostate cancer is generally considered the second most frequent type of cancer that develops in men [2].

According to the American Cancer Society, in 2022 approximately 268.490 male patients with this pathology were discovered in the United States and 34.500 patients with this diagnosis died. This shows the real problem of the disease spreading among the population. One extremely important thing is that the overall 5-year survival rate is 99% [3].

There is a genetic determinism because approximately 9% of the malignant tumors of the prostate gland are thought to be genetically predominant, and the risk increases when correlated with a family history of prostate tumors [4].

The main curative treatment is radical surgery, but other therapies such as radiotherapy, chemotherapy, and hormone therapy are also used to improve the chances of recovery [5]. Due to PET imaging evolution, radiotherapy has the potential to become the first-line treatment as a curative therapy, with or without surgical treatment, with other therapies remaining on the secondary place [1].

Cancer cells form through successive mitoses, producing various types of cells with different types of differentiation [6]. The Gleason Score was created to see the degree of cellular differentiation and to guide the treatment accordingly [7]. Depending on the Gleason score, the following groups are distinguished: Grade 1 or well differentiated, defined by a Gleason score ≤ 6 ; Grade 2 or moderately differentiated, defined by a Gleason score of $3 + 4 = 7$ or $4 + 3 = 7$; Grade 3 or poorly differentiated,

defined by a Gleason score of 8 to 10 [8], [9]. Currently, the easiest and most commonly used method for obtaining tissue for histopathological analysis and Gleason score classification is prostate needle biopsy [10].

2. MATERIALS AND METHODS

Two groups of patients diagnosed with locally advanced prostate adenocarcinoma diagnosis were analyzed between 2020 and 2024 in a study conducted at the St. Apostle Andrew County Emergency Clinical Hospital and the Dr. Aristide Serfoti Military Emergency Hospital. The total number of patients studied is 99 patients aged between 50 and 95 years.

A group was formed consisting of 43 patients from the St. Apostle Andrew County Emergency Clinical Hospital who were taken care of in the oncology ward. It should be noted that absolutely all these patients underwent radiotherapy between 2020 and 2023.

The second group of patients is from urology ward of the Dr. Aristide Serfoti Military Emergency Hospital. There were 56 patients in this cohort.

The data were obtained both from the clinical charts and computer applications. The statistical analysis performed to verify the accuracy of the data was carried out using the t-test method, which calculates the probability that two samples from the same base populations have the same means and standard deviations. The T-test considers the null hypothesis, which assumes that there is no causal relationship between a new treatment and a reduction in the symptoms of a disease. The test generates a p-value, which has the following significance: if $p < 0.05$, then the null hypothesis is rejected; if $p > 0.5$, then the null hypothesis is accepted.

In this study, two studies were conducted, a t-test between patients who had a Gleason score > 7 and developed metastases and patients who had a Gleason score < 7 and developed metastases, in this case $p = 0.00347$, the null hypothesis is accepted, and another between patients who had a Gleason score > 7 and died and patients who had a Gleason score < 7 and died, in this case $p = 0.000354$, the null hypothesis is accepted.

3. PATIENT EVOLUTION ANALYSIS DEPENDING ON THE ENVIRONMENT OF ORIGIN

For clinical practice, it is important to both identify men at high risk for prostate cancer early and provide targeted treatment.

A retrospective cohort study was conducted on 99 randomly selected patients, all with locally advanced prostate adenocarcinoma, at two hospitals, the St. Apostle Andrew County Emergency Clinical Hospital and the Dr. Aristide Serfoti Military Emergency Hospital.

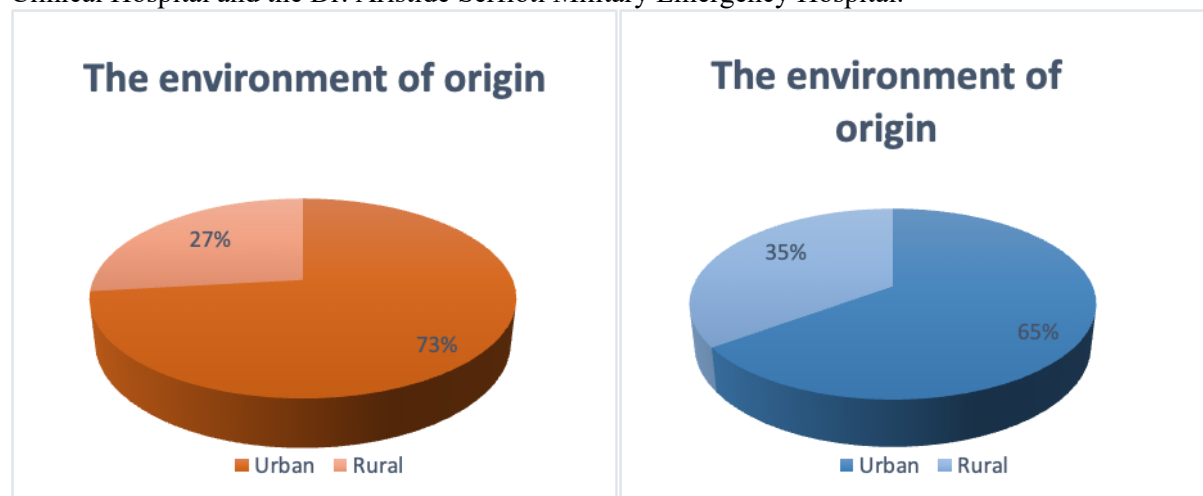


Figure 1. St. Apostle Andrew County Emergency Clinical Hospital patients divided by the environment of origin

Figure 2. Dr. Aristide Serfoti Military Emergency Hospital patients divided by the environment of origin

The study showed that almost 70% of the patients who received targeted treatment and early diagnosis were from urban areas.

According to the latest data on the DJS-Galați site, in Galați County 309944 men are registered. They are distributed almost equally in both areas (urban|rural): 134476 men in the rural area and 175468 in the urban area.

The higher percentage of patients diagnosed in urban areas is due to socio-economic disparities between urban and rural areas, as highlighted in Ioana Petre's paper, published in *sociologie.ro* magazine that shows that out of the total 100% of healthcare facilities, only 22.8% are located in Romanian villages, and medical equipment is of very low quality in rural areas. The difficulty in detecting prostate cancer in rural men is also due to their poorer medical education, lack of easy transportation, and the fact that rural patients are much less likely to seek health services.

The higher incidence of the disease in urban areas can also be explained by poor diet. A diet rich in heat-processed foods, excessive consumption of fats, and foods high in carbohydrates play an important role in the development of prostate cancer.

The disparities between the two areas, rural/urban, lead to a health inequity. This is demonstrated by the stage of tumor detection, screening, treatment, and patient management as a whole.

The study showed that in the group of patients at the Dr. Aristide Serfioți Military Emergency Hospital, mortality was 10% higher for patients from rural areas than for those from urban areas. Mortality was higher among patients from rural areas, even though the group of patients from rural areas was 17 patients smaller than the group from urban areas. This difference shows that the patients from rural areas sought medical care too late.

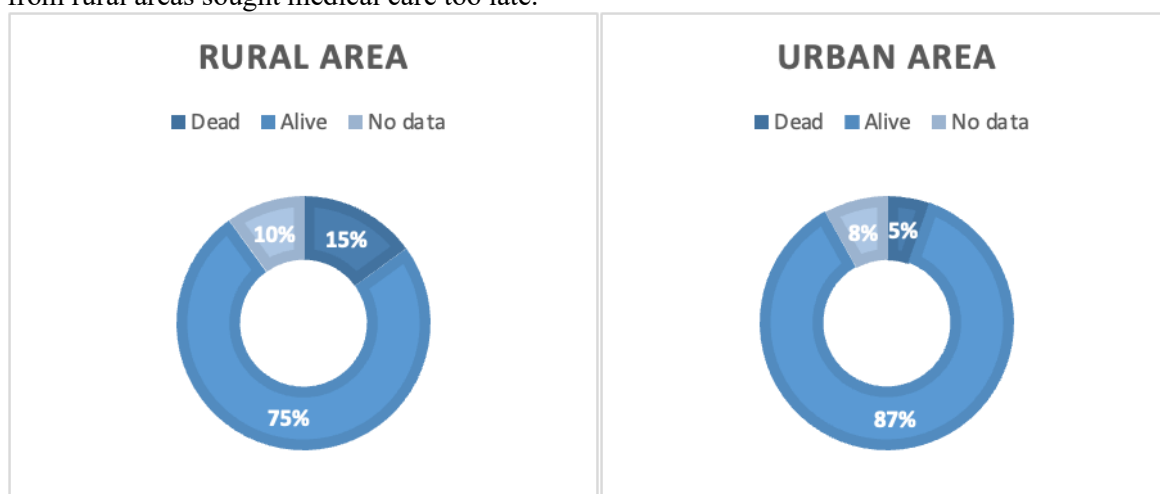


Figure 3. Patient survival rate depending on the environment of origin from the Dr. Aristide Serfioți Military Emergency Hospital

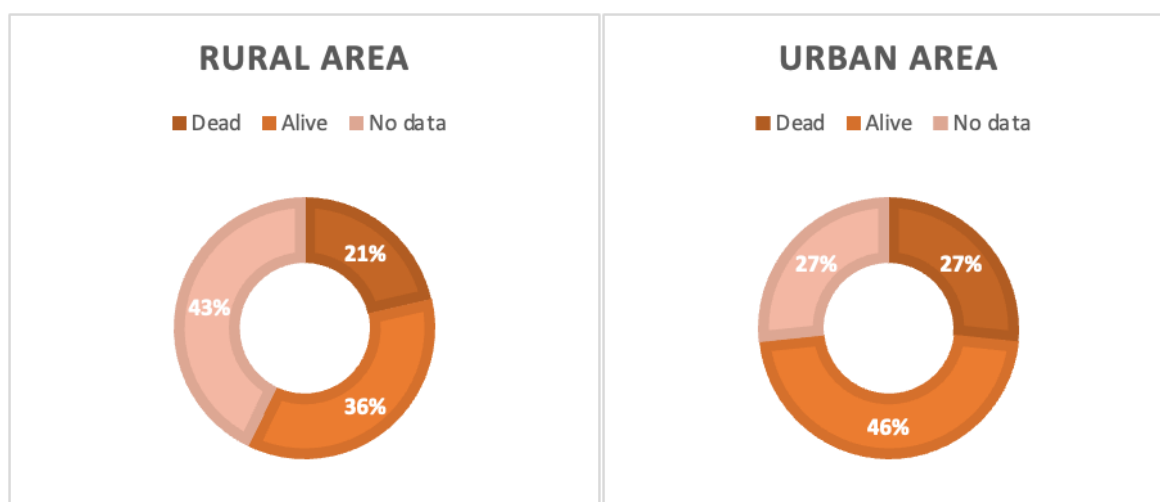


Figure 4. Patient survival rate depending on the environment of origin from the St. Apostle Andrew County Emergency Clinical Hospital

In the case of patients at the St. Apostle Andrew County Emergency Clinical Hospital, mortality was almost equal between rural and urban groups, even though the urban patient group was 16 patients larger.

The particularity of the group from the St. Apostle Andrew County Emergency Clinical Hospital was that many patients had a much more aggressive form of adenocarcinoma and many patients were undergoing palliative treatment, hence the much higher mortality rate in both cases. Analyzing the percentage difference between the two environments and the most aggressive form of adenocarcinoma, it can be observed that patients in urban areas were affected to a greater extent. This may be due to the urban lifestyle, which is much more stressful, with much less healthy food and much higher pollution levels.

Regarding the evolution of patients for whom no data on death or survival could be collected, discussions with the medical team revealed that many patients are alive.

4. PATIENT EVOLUTION ANALYSIS DEPENDING ON THE HISTOPATHOLOGICAL NATURE OF THE ADENOCARCINOMA

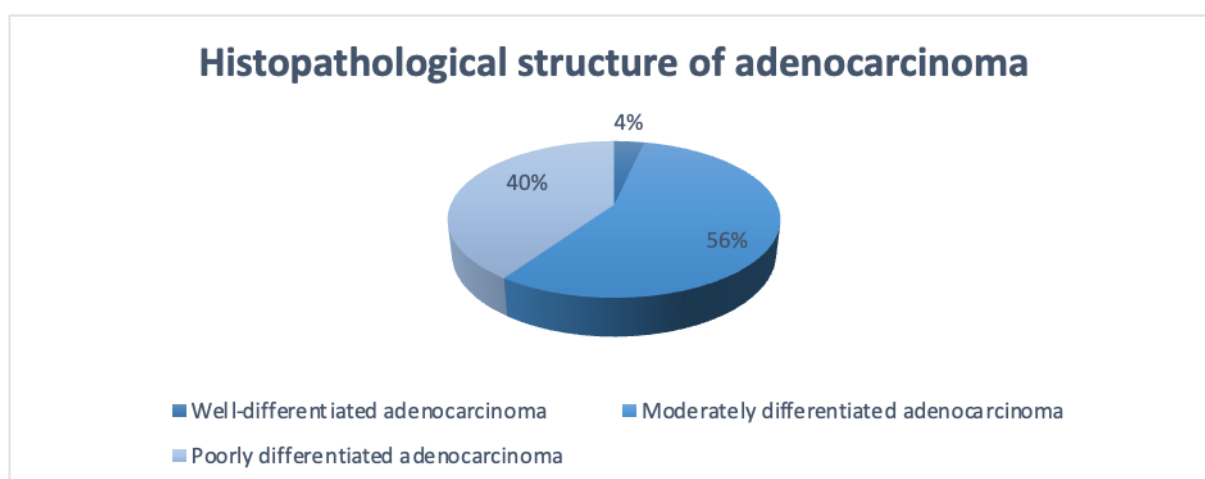


Figure 5. Histopathological structure of ADK in patients from the Dr. Aristide Serfoti Military Emergency Hospital cohort

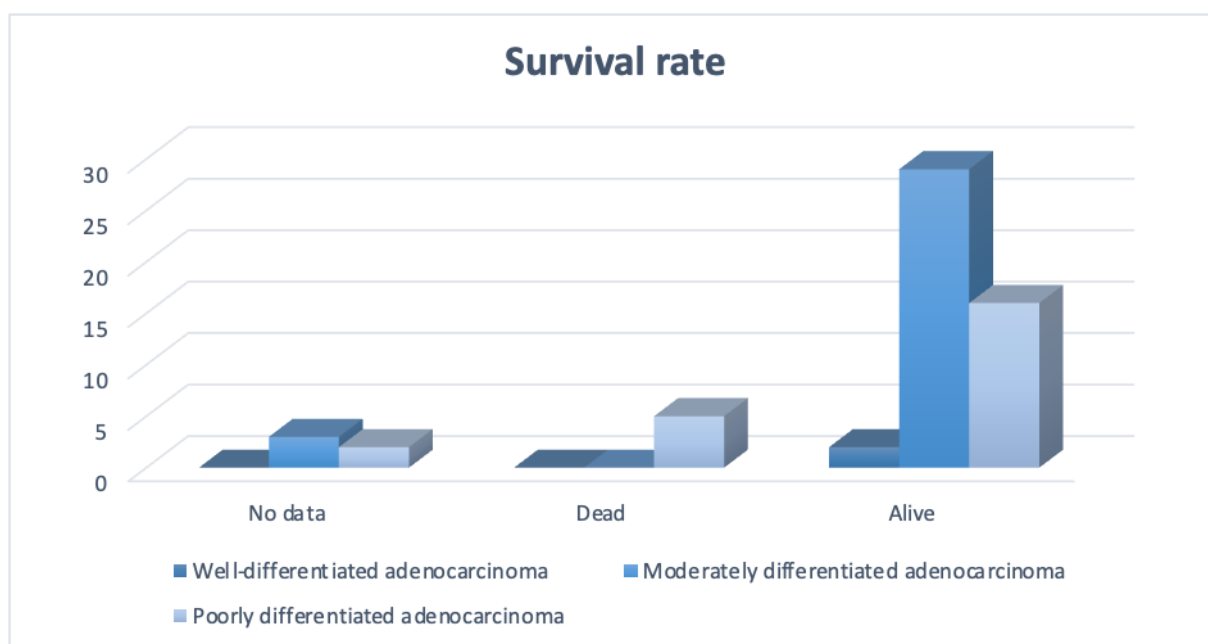


Figure 6. Survival rate of patients in the cohort at the Dr. Aristide Serfoti Military Emergency Hospital

It can be observed that, among the patients at the Dr. Aristide Serfoti Military Emergency Hospital, only those with poorly differentiated adenocarcinoma died, and there is no data on the outcome (death/survival) for three patients with moderately differentiated adenocarcinoma and two with poorly differentiated adenocarcinoma.

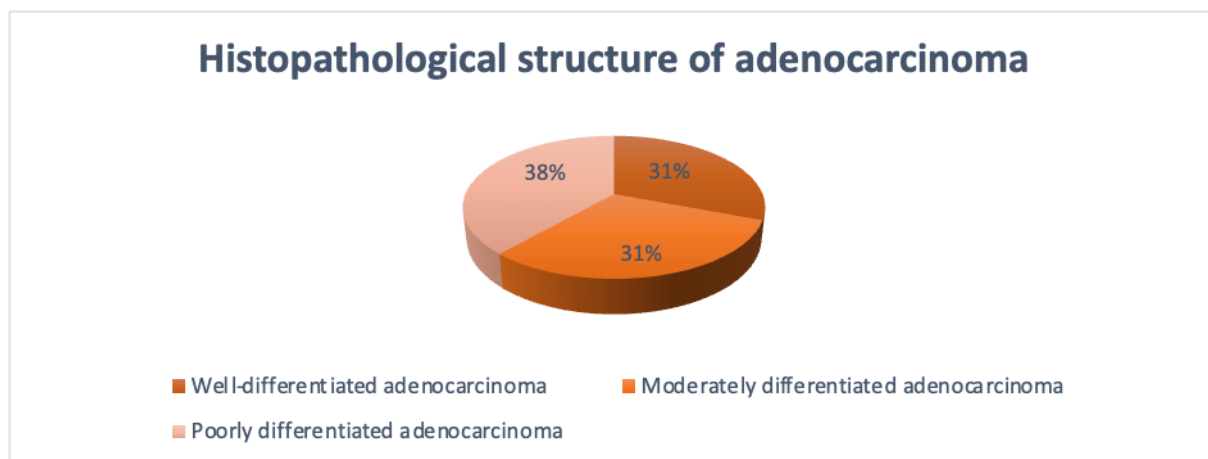


Figure 7. Histopathological structure of ADK in patients from the St. Apostle Andrew County Emergency Clinical Hospital

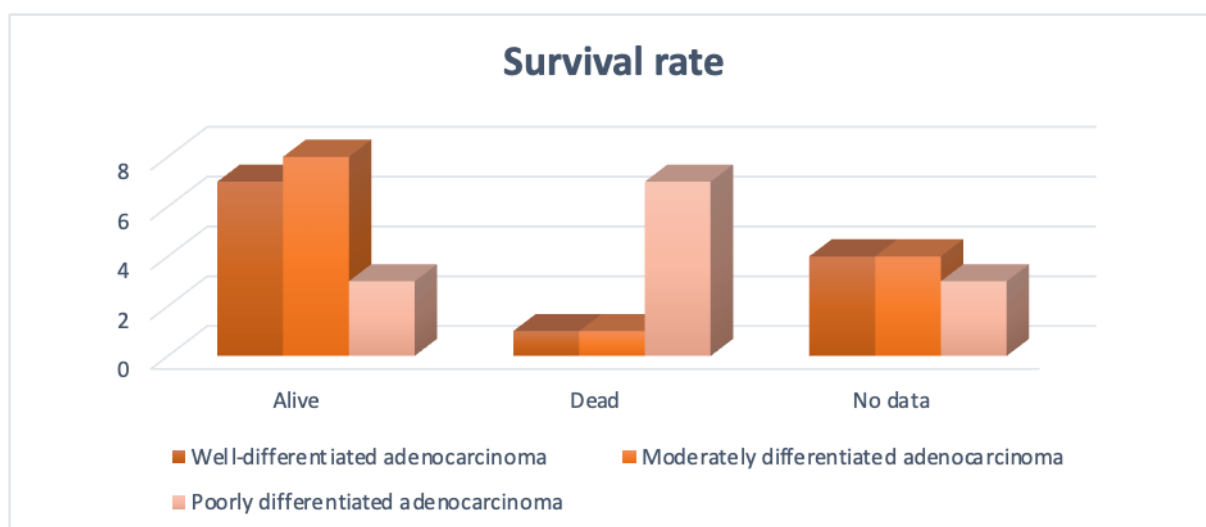


Figure 8. Survival rate of patients in the cohort at the St. Apostle Andrew County Emergency Clinical Hospital

It can be observed in Figure 1.7 and Figure 1.8 that patients who had poorly differentiated adenocarcinoma had the highest mortality rate, as this type of adenocarcinoma is more aggressive and responds less well to treatment. There were no survival data for 4 patients in the well-differentiated and moderately differentiated adenocarcinoma groups and 3 patients with poorly differentiated adenocarcinoma. The rest of the patients are alive at the time of the study.

Depending on the Gleason score, tumor size, presence or absence of metastases, comorbidities, and age, patients in both groups received personalized treatments. Of the total number of patients who had a Gleason score > 7 and for whom data were available, more than half had metastases. In the case of patients with Gleason ≤ 7 , 45 of them had no metastases, while 14 of them did.

Of the 101 patients in this study, 60 had a Gleason score ≤ 7 , and 41 had a Gleason score > 7 . From a histopathological point of view, most patients who underwent radical prostatectomy with lymphadenectomy were those who had a Gleason score of 7 or 6. Most patients who underwent chemotherapy had a Gleason score between 6 and 9. An equal number of patients with Gleason scores of 7 and 8 (the majority of the total number of patients) underwent hormone therapy. Most patients who underwent bilateral orchiectomy had a Gleason score between 8 and 9.

In patients with a Gleason score ≤ 7 , 46 patients were alive at the time of data collection and only 2 patients had died; no survival data could be collected for 11 patients with this Gleason score. On the other hand, in patients with Gleason > 7 , only 19 of them survived and 13 died, and no survival data could be collected for 8 patients.

5. CONCLUSION

The study showed that the diagnosis, progression, and survival rate of patients are directly influenced by their environment. For patients in rural areas, access to adequate medical expertise and support with effective means of transportation must be improved so that they can undergo radiotherapy and chemotherapy at a nearby hospital. As this pathology remains underdiagnosed in rural areas, there is a need to develop rural medical centers or mobile units for collecting biochemical and tumor markers, cancer education and information campaigns, access to related services such as psychological support, and support groups.

Moderately and well-differentiated adenocarcinoma was the main histopathological differentiation type in almost half of all patients. The high survival rate (over 90%) of these patients shows both the effectiveness of the treatment given and the fact that this type of adenocarcinoma is less aggressive, with a better response to treatment.

The highest mortality rate was observed in patients with poorly differentiated adenocarcinoma (approximately 40% of them died), which shows the increased aggressiveness, rapid progression, and high risk of metastasis of this type of adenocarcinoma, even though these patients received a good treatment regimen.

6. ETHICAL APPROVAL AND CONSENT FOR PARTICIPATION

The data used for this analysis were taken from patient clinical charts. And, in order to be able to collect this information, both hospitals have given their approval.

St. Apostle Andrew County Emergency Clinical Hospital: ethics commission decision Registration No. 18 847 of August 25, 2025.

Dr. Aristide Serfioti Military Emergency Hospital: medical board opinion Registration No. 212/M1-544 of September 11, 2025.

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