A prospective investigation on the patient’s educational attainment impact on the diagnosis of prostate cancer via transrectal biopsy

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Abstract

Introduction/Objective: The purpose of the present study is the prospective investigation on the association between patients’ educational attainment and prostate cancer diagnosis in a mainly racially homogeneous population (Caucasian race)

Materials & Methods: From August 2013 to April 2014, all patients (323) presenting with indications for prostate cancer biopsy procedure, were classified into 3 groups of educational attainment according to their years of education [Group A: ≤6 years (148), Group B: 6-12 years (122) and Group C:>12 years (53)]. Patients diagnosed with prostate cancer were categorised according to the D’amico risk group classification system into low, intermediate and high risk.

Results: Out of the 323 patients, 129 (39.9%) were diagnosed with prostate cancer. Prostate cancer detection rate was not statistically significant between Groups A-C (41.2% vs. 35.2% vs. 47.2%, Pearson chi-square p=0.305). However, it was found that high risk prostate cancer was statistically more common in patients with low educational attainment (41% vs. 20.9% vs. 12%, Pearson chi-square p<0.0001), with linear correlation trend (the higher the educational attainment the lower the probability for high risk cancer) [linear trend p<0.0001]. In a multi-factor analysis (Logistic Regression), a less than 6 years educational attainment constitutes an independent risk factor (age- and PSA-adjusted) in detecting high risk prostate cancer (D’ amico criteria) with OR=5.903 (1.302-26.773 95%CI), p=0.021.
Conclusions: Low educational attainment seems to be an independent risk factor in detecting high risk prostate cancer. Larger studies are necessary to investigate the causes of probable late diagnosis of prostate cancer in low educational attainment patients.

Key words
patients’ educational attainment, prostate cancer diagnosis, biopsy procedure

Introduction
According to Gilligan T. and the review of the literature from 1990 onwards, low socioeconomic status (low SES) appears to associate with poor outcomes in treating prostate cancer. Unfortunately, to date, it has not been determined whether racial/ethnic differences in diagnosing prostate cancer stem from low SES. At the same time, the understanding of the causes behind increased mortality due to prostate cancer among black males in USA constitutes a major challenge in the field of social disparities and prostate cancer. There are published indications that highly educated males are more conscious regarding PSA screening and they better understand the value of prevention and early diagnosis of prostate cancer. The aim of the present study is to evaluate the contribution of educational attainment in the initial diagnosis of high, intermediate and low risk prostate cancer in a country like Greece, where the population is mainly racially homogeneous (Caucasian race).

Materials & methods
From August 2013 to April 2014, all patients presenting with indications for prostate cancer biopsy procedure, were asked of their educational attainment which was then dictated in special research material according to the reported years. The patients, according to their years of education, were then divided into three groups, each one representing primary, secondary and tertiary education in Greece. Thus, Group A

![Figure 1 Patients who underwent prostate biopsy were categorized into 3 groups according to their years of education](image)
comprised patients with ≤6 years of education, Group B comprised patients between >6 and ≤12 years of education and Group C >12 years of education. The ethnic as well as the racial origin of the patients were other particulars also dictated in the research material prior to the prostate biopsy procedure. For these patients, age pre-biopsy PSA levels, transrectally measured prostate volume and biopsy histological report, were also recorded.

Biopsy results showing high grade prostatic intraepithelial neoplasia (PIN) or atypical small acinar proliferation (ASAP) in the histological sample preparation but no cancer co-existence, were considered negative for malignancy. In patients who underwent initial biopsy, a total of 10-14 tissue blocks respective of the prostate size were received whereas in patients who underwent repeat biopsy, 20-24 tissue blocks respective of the prostate size were received. The D'amico criteria were applied in the assessment of cancer risk levels. So, the patients with positive for malignancy biopsy were classified into three categories: low risk (Gleason score ≤ 6 and PSA ≤ 10 and clinical stage cT1-T2a), intermediate risk (Gleason score = 7 or PSA between 10-20 or clinical stage cT2b) and high risk (Gleason score ≥ 8 or PSA ≥ 20 or clinical stage cT2c-T3a).

The SPSS v.17 software was used for the statistical analysis of the results. For the comparison of the continuous variables with normal distribution among the groups, we used the one-way analysis of variance (one-way ANOVA) and the Bonferroni post-hoc test where a statistical significance was found. The non-parametric continuous variables among the groups were compared via the Kruskal-Wallis H test. The Mann-Whitney U test was used for the comparison of paired sub-groups; statistical significance was established. For the purposes of comparing the categorical variables, the x² test was used for tables 2x3, 3x3 or 2x2 according to the number of variables’ categories. Finally, the statistically significant variables as well as the age, regardless of its significance, were analysed on a multifactor model (Logistic Regression model) as initially unweighted and finally weighted in order to evaluate the educational attainment as an independent prognostic risk factor.
Results

In total, 323 consecutive patients with prostate cancer biopsy indications were investigated – 148 (45.8%) belonged to Group A based on their educational attainment, 122 (37.8%) to Group B and 53 (16.4%) to Group C (Figure 1). Out of the 323 patients, 129 (39.9%) were diagnosed with prostate cancer and 194 (60.1%) had prostate cancer-free biopsy preparation. All patients were Caucasian and synchronously 97.88% of them were of Greek origin. Table 1 depicts the differences among Groups A-C according to the variables assayed.

Age (Table 1) was statistically significantly different among the Groups (ANOVA, p<0.0001). Namely, Group A patients were of older age compared to the other Groups (Bonferroni post-hoc test, p<0.0001); age was not different between Groups B and C (p=1). Moreover, among the Groups, biopsy PSA levels (Table 1) were statistically significantly different (Kruskal-Wallis test, p=0.003) and specifically between Group A and B (p=0.003), between Groups A and C (p=0.013) and between Groups B and C (p=0.898). It is thusly evident that patients with low educational attainment (especially <6 years) presented for the biopsy procedure with elevated PSA levels compared to the highly educated patients. It is also of interest that the prostate volume (Table 1) was statistically significantly different among the Groups (Kruskal-Wallis test, p=0.003); namely, tertiary education patients (Group C) seem to have a smaller prostate size than Group A (p=0.003) and Group B.
patients (p=0.002). Groups A and B exhibited no differences between them (p=0.408).

Prostate cancer detection rate was not found statistically significantly different between Groups A-C (41.2% vs. 35.2% vs. 47.2%, Pearson chi-square p=0.305). However (Figure 2), it was found that high risk prostate cancer was statistically more common in patients with low educational attainment (41% vs. 20.9% vs. 12%, Pearson chi-square <0.0001), with linear correlation trend (the higher the educational attainment the lower the probability for high risk cancer) [linear trend p<0.0001]. For the purposes of investigating whether low educational attainment (<6 years), constitutes a risk factor in detecting high risk prostate cancer (D’ amico criteria), a multifactor analysis model was designed (Logistic Regression); the assay variables were age, PSA values and educational attainment. Thus, it appears that all these parameters are risk factors in detecting high risk prostate cancer by biopsy (Table 2). It is also shown that educational attainment <6 years is an independent risk factor (age- and PSA-weighted) to detect high risk prostate cancer (D’ amico criteria) with OR=5.903 (1.302-26.773 95%CI), p=0.021.

Discussion

According to the Cancer Prevention Study II (CPS-II) Nutrition Cohort which was conducted in the USA from 1992 to 2000 (72,449 male participants) on the impact of the educational attainment on prostate cancer diagnosis and mortality, men with at least secondary education (high school) had significantly lower mortality rates compared to men with less years of education. In men with at least tertiary education (college education), compared to men with fewer years of education, an increased frequency of 15-19% in diagnosing prostate cancer was revealed but this difference was focused on radically treatable clinically identified prostate cancer⁴. Retrospectively, low educational attainment was also found to relate to late prostate cancer diagnosis (metastatic stage), among 1,390 males in Brazil. Indeed, the probability of diagnosis at the advanced stage of metastatic prostate cancer was estimated in the study to increase by 4.8 in patients with less than 8 years of education⁵. A large epidemiological research in Sweden on overall survival (OS) in patients suffering from various types of cancer, revealed statistically significant reduced survival in patients with low educational attainment (<9 years) compared to university-educated patients who exhibited longer survival by 40% in total. Prostate gland cancer was one of the malignancies under investigation⁶. Similar outcomes were also delivered by the GLOBE study in Holland. But in this study, high educational attainment was evidently correlated with an increased 5-year survival only for prostate cancer contrary to the absence or questionable contribution of the educational attainment in surviving breast, colon and microcytic lung cancers. Co-morbidities, physical exercise and smoking, though found to influence prostate cancer survival, were not found to affect the important role of educational attainment⁷.
The findings of another large epidemiological research conducted in Lithuania between July 2001 and December 2004 are also interesting. According to the study, despite the statistically significantly lower probability in diagnosing prostate cancer in males of lower educational attainment - always in comparison to highly educated males- the disease-specific mortality was significantly higher in men with low educational attainment. Access inequality to health care services was speculated as a potential cause for the aforementioned epidemiological observation. Nevertheless, in the large European Randomized Study of Screening for Prostate Cancer (ERSPC), low educational attainment was also identified as one of the primary aetiological factors under investigation regarding the refusal to undergo prostate cancer screening, among the patients who refused to participate in the screening procedure to diagnose prostate cancer. In a smaller sample of subjects, 104 African-Americans, following a specially designed informational-educational intervention on prostate cancer screening, high educational attainment and SES were associated with the participation in the study. According to Karlsen RV et al., among 1,051 men diagnosed with prostate cancer between 1993-2008 during the Danish Diet, Cancer and Health Cohort study, high educational attainment was statistically significantly linked to clinical indication-free PSA screening. Simultaneously, prostate cancer diagnosis in males via PSA screening, in absence of clinical signs, was statistically significantly correlated to clinically localised cancer and radical treatment probability.

Shared conclusions were reached by Burns et al in Ireland, throughout the 2007 Survey of Lifestyle and Nutrition (SLAN); SES, educational attainment and private insurance scheme were associated with the increased probability of prostate cancer screening. It has already been highlighted that low educational attainment patients do not easily apprehend the great importance both of screening and early prostate cancer diagnosis.

According to the retrospective study by Srougi V et al, low income and low educational attainment was considered as an independent factor for biochemical recurrence (BR) following radical prostatectomy (RP) in patients with pre-operatively clinically localised prostate cancer. Older age and more aggressive prostate cancer upon diagnosis were viewed as a potential cause behind the study’s findings. According to Huber et al’s findings, on a cohort of 349 patients with clinically localized prostate cancer diagnosis, high educational attainment was also found to statistically significantly associate to a higher level of awareness on the clinical parameters of the disease and the use of internet throughout the treatment decision-making process. Two years later, in 2013, Kazer MW et al, in a total of 338 patients diagnosed with prostate cancer, demonstrated that low educational attainment was linked to the reported increased perception of uncertainty and danger – the greater the perception of danger and uncertainty, the less the satisfaction from the treatment outcomes. Questions are also raised by epidemiological observations in England and Australia, that low SES patients are less likely to undergo RP or radiation therapy for prostate cancer with a synchronous reduction of 3-year survival especially in rural and public hospital patients.
Our research delivers similar results to the above studies but here it is of interest that while there is no statistically significantly higher detection of prostate cancer on biopsy in low educational attainment patients, yet, it is of high risk. The indifferent prostate cancer detection rate can be attributed to the choice criteria of patients with clinical indications for prostate biopsy, performed in a specialised prostate cancer outpatient clinic office on a weekly on-going basis for all patients. A great advantage of our study is the fact that it was designed to collect prospective and not retrospective data. Nonetheless, larger multicenter prospective studies focusing on the investigation and addressing the causes underlying late prostate cancer diagnosis in low educational attainment patients are deemed necessary. Moreover, while low educational attainment patients appear to be of older age and with elevated PSA levels, the multifactor analysis shows that low educational attainment is not affected and it continues to constitute an independent risk factor in detecting high risk prostate cancer, regardless of age and PSA levels.

Conclusions
In the present prospective study, the determinant role of low educational attainment in diagnosing high risk prostate cancer in a region like Macedonia, populated by phylogenetically homogeneous males, is confirmed. In addition, it seems that low educational attainment patients are of older age and undergo prostate biopsy on higher PSA levels. All the aforementioned support the theory that low educational attainment patients probably present late for prostate cancer examination, without participating in screening programmes.
20,9% έναντι 12%, Pearson chi-square p <0,0001), με γραμμική τάση συσχέτισης (όσο υψηλότερο είναι το μορφωτικό επίπεδο τόσο μικρότερη είναι η πιθανότητα για καρκίνο υψηλού κινδύνου) [γραμμική τάση p <0,0001]. Σε μία πολυπαραγοντική ανάλυση (Logistic Regression), το χαμηλό μορφωτικό επίπεδο (λιγότερο από 6 χρόνια εκπάιδευσης) αποτελεί ένα ανεξάρτητο παράμετρο παράγοντα (προσαρμοσμένο σε ηλικία και τιμές PSA) για την ανίχνευση καρκίνου του προστάτη υψηλού κινδύνου (κριτήρια κατά D’Amico) με OR = 5.903 (1,302 - 26,773 95% CI), p = 0,021.

Συμπεράσματα: Το χαμηλό επίπεδο εκπαίδευσης φαίνεται να είναι ένα ανεξάρτητος παράμετρος παράγοντας κινδύνου για την ανίχνευση του καρκίνου του προστάτη υψηλού κινδύνου. Μεγαλύτερες μελέτες είναι αναγκαίες για τη διερεύνηση των αιτιών της πιθανής καθυστερημένης διάγνωσης του καρκίνου του προστάτη σε χαμηλού μορφωτικού επιπέδου ασθενείς.

Λέξεις ευρετηριασμού
μορφωτικό επίπεδο, διάγνωση καρκίνου του προστάτη, βιοψία

References


