Does ethnicity and education influence preoperative disability and expectations in patients undergoing total knee arthroplasty?
Kudibal, Madeline Therese; Kallemose, Thomas; Troelsen, Anders; Husted, Henrik; Gromov, Kirill

Published in:
World Journal of Orthopedics

DOI:
10.5312/wjo.v9.i10.220

Publication date:
2018

Document version
Publisher's PDF, also known as Version of record

Document license:
CC BY-NC-ND

Citation for published version (APA):
Kudibal, M. T., Kallemose, T., Troelsen, A., Husted, H., & Gromov, K. (2018). Does ethnicity and education influence preoperative disability and expectations in patients undergoing total knee arthroplasty? World Journal of Orthopedics, 9(10), 220-228. https://doi.org/10.5312/wjo.v9.i10.220
### MINIREVIEWS
185  
**Intra-operative computed tomography guided navigation for pediatric pelvic instrumentation: A technique guide**  
*Anari JB, Cahill PJ, Flynn JM, Spiegel DA, Baldwin KD*

### ORIGINAL ARTICLE

#### Basic Study
190  
**Dose of alendronate directly increases trabeculae expansivity without altering bone volume in rat femurs**  
*Weiss SG, Kuchar GO, Gerber JT, Tiboni F, Storrer CLM, Casagrande TC, Giovanini AF, Scariot R*

#### Retrospective Study
198  
**Reducing costly falls after total knee arthroplasty**  
*Bolarinwa SA, Novicoff W, Cui Q*

#### Observational Study
203  
**Screw placement is everything: Risk factors for loss of reduction with volar locking distal radius plates**  
*Drobetz H, Black A, Davies J, Buttner P, Heal C*

#### Observational Study
203  
**Long-term results of an anatomically implanted hip arthroplasty with a short stem prosthesis (MiniHip™)**  
*von Engelhardt LV, Breil-Wirth A, Kohny C, Seeger JB, Grasselli C, Jerosch J*

220  
**Does ethnicity and education influence preoperative disability and expectations in patients undergoing total knee arthroplasty?**  
*Kudibal MT, Kallemose T, Troelsen A, Husted H, Gromov K*

### SYSTEMATIC REVIEW
229  
**Total knee arthroplasty in patients with Paget’s disease of bone: A systematic review**  
*Popat R, Tsitskaris K, Millington S, Dawson-Bowling S, Hanna SA*
World Journal of Orthopedics

Volume 9  Number 10  October 18, 2018

ABOUT COVER
Editorial Board Member of World Journal of Orthopedics, Antonios Angoules, MD, PhD, Surgeon, Orthopaedic Department, Athens Medical Center, Athens, Greece

AIM AND SCOPE
World Journal of Orthopedics (World J Orthop, WJO, online ISSN 2218-5836, DOI: 10.5312) is a peer-reviewed open access academic journal that aims to guide clinical practice and improve diagnostic and therapeutic skills of clinicians.

WJO covers topics concerning arthroscopy, evidence-based medicine, epidemiology, nursing, sports medicine, therapy of bone and spinal diseases, bone trauma, osteoarthropathy, bone tumors and osteoporosis, minimally invasive therapy, diagnostic imaging. Priority publication will be given to articles concerning diagnosis and treatment of orthopedic diseases. The following aspects are covered: Clinical diagnosis, laboratory diagnosis, differential diagnosis, imaging tests, pathological diagnosis, molecular biological diagnosis, immunological diagnosis, genetic diagnosis, functional diagnostics, and physical diagnosis; and comprehensive therapy, drug therapy, surgical therapy, intervention treatment, minimally invasive therapy, and robot-assisted therapy.

We encourage authors to submit their manuscripts to WJO. We will give priority to manuscripts that are supported by major national and international foundations and those that are of great basic and clinical significance.

INDEXING/ABSTRACTING
World Journal of Orthopedics is now abstracted and indexed in PubMed, PubMed Central, Emerging Sources Citation Index (Web of Science), China National Knowledge Infrastructure (CNKI), and Superstar Journals Database.

EDITORS FOR THIS ISSUE

| NAME OF JOURNAL | World Journal of Orthopedics |
|------------------|-----------------------------|
| ISSN             | ISSN 2218-5836 (online)    |
| LAUNCH DATE      | November 18, 2010           |
| FREQUENCY        | Monthly                     |
| EDITOR-IN-CHIEF  | Bao-Gan Peng, MD, PhD, Professor, Department of Spinal Surgery, General Hospital of Armed Police Force, Beijing 100039, China |
| EDITORIAL BOARD MEMBERS | All editorial board members resources online at http://www.wjgnet.com/2218-5836/editorialboard.htm |
| EDITORIAL OFFICE | Jin-Lei Wang, Director     |

| Responsible Assistant Editor | Xiang Li |
|------------------------------|---------|
| Responsible Electronic Editor| Han Song|
| Proofing Editor-in-Chief     | Liu-Sheng Ma |
| Responsible Science Editor   | Ying Dou |
| Proofing Editorial Office Director | Jin-Lei Wang |

PUBLISHER
Baishideng Publishing Group Inc
7901 Stoneridge Drive, Suite 501, Pleasanton, CA 94588, USA
Telephone: +1-925-2238242
Fax: +1-925-2238243
E-mail: editorialoffice@wjgnet.com
Help Desk: http://www.f6publishing.com/helpdesk
http://www.wjgnet.com

COPYRIGHT
© 2018 Baishideng Publishing Group Inc. Articles published by this Open-Access journal are distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non commercial and is otherwise in compliance with the license.

SPECIAL STATEMENT
All articles published in journals owned by the Baishideng Publishing Group (BPG) represent the views and opinions of their authors, and not the views, opinions or policies of the BPG, except where otherwise explicitly indicated.

INSTRUCTIONS TO AUTHORS
http://www.wjgnet.com/bpg/goutinfo/204

ONLINE SUBMISSION
http://www.f6publishing.com
Does ethnicity and education influence preoperative disability and expectations in patients undergoing total knee arthroplasty?

Madeline Therese Kudibal, Thomas Kallemose, Anders Troelsen, Henrik Husted, Kirill Gromov

AIM
To investigate whether minority ethnicity and the duration of education influence preoperative disability and expectations in patients undergoing total knee arthroplasty.

METHODS
We prospectively included 829 patients undergoing primary unilateral total knee arthroplasty (TKA) from April 2013 to December 2014 at a single centre. Patients filled in pre-operative questionnaires with information regarding place of birth, duration of education, and interpretation; Kudibal MT and Gromov K contributed to writing the article; all authors contributed to editing, reviewing and final approval of article.

Supported by the Danish Rheumatism Association, No. R111-A2587.

Conflict-of-interest statement: All authors declare that they have no conflicts of interest.

STROBE statement: the STROBE checklist was adopted in preparation of this manuscript.

Open-Access: This article is an open-access article which was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/

Received: April 28, 2018
Peer-review started: April 28, 2018
First decision: June 15, 2018
Revised: June 22, 2018
Accepted: June 27, 2018
Article in press: June 27, 2018
Published online: October 18, 2018
Does ethnicity and education influence preoperative disability
Kudibal MT, Kallemose T, Troelsen A, Husted H, Gromov K.

We investigated whether minority ethnicity and duration of education influence preoperative disability and expectations in patients undergoing total knee arthroplasty. We conducted a prospective cohort study that included all patients undergoing primary TKA at our institution from April 1st 2013 to December 8th 2014. Exclusion criteria were simultaneous bilateral TKA and missing data on education/country of origin. Prior to surgery, patients were asked to fill in a questionnaire regarding patient demographics, pre-OP symptoms and expectations about surgery outcome. All patients were asked to fill in another questionnaire one year post-OP via email or regular mail, and 370 patients completed a one-year follow-up questionnaire (Figure 1). A clinical control was not conducted. Patients filled in the questionnaire independently or with help from healthcare providers.

Core tip: We investigated whether minority ethnicity and duration of education influence preoperative disability and expectations in patients undergoing total knee arthroplasty. This should be taken into account when patients are advised pre-operatively.

Key words: Socioeconomic factors; Ethnicity; Education; Expectations to surgery; Preoperative disability; Total knee arthroplasty

© The Author(s) 2018. Published by Baishideng Publishing Group Inc. All rights reserved.

Kudibal MT, Kallemose T, Troelsen A, Husted H, Gromov K. Does ethnicity and education influence preoperative disability and expectations in patients undergoing total knee arthroplasty? World J Orthop 2018; 9(10): 220-228 Available from: URL: http://www.wjgnet.com/2218-5836/full/v9/i10/220.htm DOI: http://dx.doi.org/10.5312/wjo.v9.i10.220

INTRODUCTION

Thousands of patients undergo total knee arthroplasty (TKA) every year worldwide. In recent years, pre-operative (pre-OP) planning and patient information has been streamlined by using the fast-track concept[1]. This operation has excellent results in terms of survival, with a reported ten-year prosthetic survival of close to 95% (National Hospital Discharge Survey 2010); however, patient satisfaction remains a challenge, with up to 20% of patients being dissatisfied with their one-year post-operative (post-OP) outcomes[2,3]

Outcome is known to be influenced by patient-related factors that include age, pre-OP symptoms[4-6], comorbidities and mental health status, such as depression and anxiety[7]. Previous studies have shown that patient satisfaction can be influenced by both surgery-related factors, such as implant alignment[8-10], implant brand and hospital type[11], as well as patient-related factors including age, pre-OP symptoms and expectations[12]. Other less well-defined factors have also been shown to influence outcome following TKA and THA, such as socioeconomic factors[11,12] and duration of education[13]. Understanding the way that ethnicity and the duration of education influence both pre-OP symptoms and post-OP outcome in TKA patients will assist healthcare providers in determining specific areas of possible improvement and adjusting treatment options appropriately. Furthermore, it will assist in more accurate comparisons of study populations in future research.

The purpose of the study was to investigate whether minority ethnicity and duration of education influence pre-OP disability and expectations in patients undergoing TKA.

MATERIALS AND METHODS

We conducted a prospective cohort study that included all patients undergoing primary TKA at our institution from April 1st 2013 to December 8th 2014. Exclusion criteria were simultaneous bilateral TKA and missing data on education/country of origin. Prior to surgery, patients were asked to fill in a questionnaire regarding patient demographics, pre-OP symptoms and expectations about surgery outcome. All patients were asked to fill in another questionnaire one year post-OP via email or regular mail, and 370 patients completed a one-year follow-up questionnaire (Figure 1). A clinical control was not conducted. Patients filled in the questionnaire independently or with help from...
family members. All surgeries were performed in a standardized fast-track setup by experienced surgeons specializing in arthroplasty surgery, each having performed > 100 primary TKAs annually. The standard surgical protocol for TKA includes spinal analgesia, standardized fluid management, use of preoperative intravenous tranexamic acid, preoperative single-shot high-dose methylprednisolone and absence of drains. All TKAs were performed with a standard medial parapatellar approach without the use of tourniquet, with an application of local infiltration analgesia and postoperative compression bandaging. Postoperative opioid-sparing pain treatment consisted of celecoxib 200 mg/12 h and paracetamol 1 g/6 h with rescue analgesics [administered if visual analogue scale (VAS) > 50 mm at rest] consisting of 10 mg oral morphine as needed. Physiotherapy was started on the day of surgery and continued until discharge. Rivaroxaban (Bayer, Denmark) was used as oral thromboprophylaxis starting 6 to 8 h postoperatively and continued daily until discharge. Mechanical thromboprophylaxis and extended oral thromboprophylaxis were not used. Patients were discharged to their own home upon fulfilling functional discharge criteria.

Preoperative disability was measured by Oxford knee score (OKS), self-reported quality of life (QoL), knee pain during activity measured on VAS, and overall symptoms and expectations. OKS ranges from 0 to 48, with lower numbers indicating more severe symptomatic disease. All VAS scales in this study range from 0 to 100. For pain and symptoms, higher values represent the worst conditions, while high values on the scale for QoL represent the best conditions. Patients were stratified based on duration of education and place of birth. Ethnicity was divided into two groups, majority and minority ethnicity. Majority ethnicity was defined as patients born in Denmark (the study country), and minority ethnicity was defined as all patients born outside Denmark. As the level of education varies between countries, education was stratified based on duration (< 9 years, 9-12 years and > 12 years of education). Preoperatively, we registered baseline-characteristics including alcohol consumption, smoking, BMI and comorbidity. Comorbidity was registered as heart disease, lung disease, previous stroke, kidney disease, liver disease, diabetes and autoimmune disease. We also registered symptoms (OKS, use of walking aids, walking distance, pain on VAS score during rest and activity) self-reported QoL, and expectations for post-OP symptoms and QoL. Finally, we registered self-reported post-OP symptoms and self-reported QoL using the one-year post-op questionnaire.

As all our results are based on patient reported outcome measures, we take into account the minimal clinically important difference (MCID). For OKS, this is acknowledged to be four-five. For VAS scales in knee arthritis patients, MCID has been reported to be around 20 points.

**Statistical analysis**

All data were processed in R 3.2.2. All measurements were reported as mean with standard deviation (SD) for continues variables and number with percent for categorical variables. Tests for association of minority ethnicity with continues interest variables was done by t-test or for non-normal distributed variables by Wilcoxon sum rank test. Association with categorical interest variables was done by chi-squared or, in cases with expected values below 5, Fishers exact test. Associations between education duration groups and the interest variables were done for continues variables by uni-
RESULTS

We included 894 consecutive and unselected patients undergoing TKA at our institution. The following were excluded: simultaneous bilateral TKA (n = 52) and missing data on education/country of origin (n = 13), thus leaving 829 patients for analysis.

For the total population, mean ± SD at time of surgery was 66.8 (10) years, 63.4% were female and 764 (92.2%) of patients were of majority ethnicity. Specifically, 24.5% of patients had an education of < 9 years, 44.8% of 9-12 years and 30.8% > 12 years (Table 1). Mean pre-OP OKS (SD) was 23.6 (8). Patients of minority ethnicity were younger compared to patients of majority ethnicity (P = 0.045) and had a shorter education (72.3% had an education of 0-9 years while only 20.4% of patients with majority ethnicity had an education of this length (P < 0.001) (Table 2). Patients of minority ethnicity had a lower pre-OP OKS (P < 0.005), higher knee pain during activity (P < 0.001), and a significantly larger proportion were dependent on a walking aid (P = 0.026) (Table 2). Furthermore, this patient group had a significantly lower expectation to their post-OP pain during activity (P = 0.016) and overall symptoms (P = 0.016). Patients with an education of > 12 years were older at the time of surgery, with a mean age of 67.7 years compared to 64.8 years for patients with an education of 0-9 years (P < 0.001). Patients with an education > 12 years reported a lower pre-OP OKS compared to the groups with 9-12 years and < 9 years of education (P < 0.001). Concurrent to this, patients with an education > 12 years had a higher pre-OP VAS for knee pain during activity compared to the other groups (P = 0.002, expectation measures also differed between the education groups (all P ≤ 0.008)). Women composed a higher proportion of the highly educated group, with 73.4% compared to 57.1% and 63.0% in the middle and low education groups, respectively (P = 0.003) (Table 3).

Response-rates to the post-OP questionnaire were 44.6% (n = 370). We found a higher response-rate for patients of majority ethnicity (46.2% vs 26.2% for minority ethnicity patients). We also found that responders overall had a longer duration of education, the biggest difference seen in education of 0-9 years (29.2% for non-responders vs 18.6% for responders, P < 0.001). The differences between responders and non-responders for other parameters was not statistically significant.

Patients of minority ethnicity had significantly lower mean OKS one year post-OP compared with patients of majority ethnicity (P = 0.002). Patients of minority ethnicity also reported higher pain during activity (P = 0.001), a significantly lower QoL (P = 0.001) and significantly higher overall symptom score (P = 0.001) compared with patients of majority ethnicity. Although patients of minority ethnicity had higher post-OP pain, we also found a larger difference between pre-OP and post-OP pain compared to patients of majority ethnicity (P = 0.049) (Table 2). Patients with educations > 12 years had significantly higher knee pain post-OP (P = 0.006), however there was also a larger difference between pre-OP and post-OP pain during activity (P = 0.069) and QoL (P = 0.017) (Table 3).

DISCUSSION

In this prospective study, we found that patients of minority ethnicity report more severe pre-OP symptoms (lower OKS and higher overall pain level) and have lower expectations for post-OP outcome compared to patients of majority ethnicity. Patients of minority

| Table 1 Characteristics of the total patient population n (%) |
|-------------------------------------------------------------|
| **Baseline characteristics**                                |
| BMI (mean ± SD)                                             | 29.7 ± 5 |
| Age (mean ± SD)                                             | 66.8 ± 10 |
| Gender                                                      |          |
| Male                                                        | 308 (36.6) |
| Female                                                      | 534 (63.4) |
| Smoking                                                     |          |
| Non-smoker                                                  | 492 (58.6) |
| Former smoker                                               | 213 (25.4) |
| Active smoker                                               | 134 (16) |
| Duration of education                                       |          |
| More than 12 yr                                            | 255 (30.8) |
| 9-12 yr                                                     | 371 (44.8) |
| 0-9 yr                                                     | 203 (24.5) |
| Ethnicity                                                   |          |
| Born in Denmark                                            | 764 (92.2) |
| Born outside Denmark                                       | 65 (7.8) |
| Preoperative level of function and symptoms                 |          |
| Walking aid outside the home                                |          |
| None                                                       | 597 (71.2) |
| One cane                                                   | 133 (15.9) |
| Two canes                                                  | 34 (4.1) |
| Wheeled walker                                             | 69 (8.2) |
| Do not leave the home                                      | 6 (0.7) |
| Oxford knee score (mean ± SD)                              | 23.6 ± 8 |
| Knee pain during activity                                  | 63 (1.000) |
| Quality of life, median (range)                            | 47 (1.000) |
| Level of symptoms, median (range)                          | 50 (1.000) |
| Preoperative expectations                                  |          |
| Knee pain 1 yr after surgery, median (range)               | 2 (1.000) |
| Quality of life 1 yr post-OP, median (range)               | 94 (1.000) |
| Level of symptoms 1 yr post-OP, median (range)             | 3 (0.99) |

Visual analogue scale 0-100. BMI: Body mass index.
ethnictiy also report more severe symptoms post-OP, however our response rate was too low to regard the results as significant. Patients with an education > 12 years report more severe pre-OP symptoms (OKS and overall pain level) compared to patients with both < 9 years and 9-12 years of education. Post-OP, we found that patients with an education > 12 years reported higher overall pain.

It is generally acknowledged that patient’s overall health is associated with socioeconomic factors. Recently, Lavernia et al. showed that expectations and the knowledge of prosthetic surgery in patients with knee and hip arthritis depend on ethnicity. The same observation was made by Krupic et al., who showed that patients born outside of Sweden had a poorer outcome after total hip replacement than patients born within Sweden. This is concurrent with our results, as we find that patients born outside the country have greater preoperative disability (lower OKS and higher VAS for pain). However, the studies describing the correlations between ethnicity and surgery are few and based on short-term observation.

In general, minority groups in western countries are less likely to undergo knee replacement than their locally-born counterparts. Our data show that patients of minority ethnicity have lower expectations for surgery and suffer from more severe symptoms pre-OP than patients of majority ethnicity. The reason for this difference is unknown, but we could speculate that patients of minority ethnicity might seek doctors at a lesser progressed stage of the disease compared to patients of majority ethnicity due to cultural or language barriers. Shahid et al. reports that racial disparities in treatment of OA are caused by patient preferences, patients education/knowledge of osteoarthritis (OA) and expectations for post-OP outcome. Minority Americans were found to have lower expectations of the overall effect of OA surgery and higher expectations of post-OP pain. This supports our findings that patients of minority ethnicity...
### Table 3  Significance of duration of education a (%) 

| Baseline characteristics | Education 0-9 yr | Education 9-12 yr | Education > 12 yr | P value (adjusted) |
|--------------------------|------------------|-------------------|-------------------|-------------------|
| **BMI, mean ± SD**       | 28.7 ± 5         | 30.0 ± 6          | 30.5 ± 5          | <0.001 (0.007)    |
| **Age, mean ± SD**       | 64.8 ± 10        | 67.8 ± 10         | 67.7 ± 11         | <0.001 (0.005)    |
| **Gender**               |                  |                   |                   |                   |
| Male                     | 92 (36.1)        | 159 (42.9)        | 54 (26.6)         | <0.001 (0.003)    |
| Female                   | 163 (63.9)       | 212 (57.1)        | 149 (73.4)        |                   |
| **Ethnicity**            |                  |                   |                   |                   |
| Majority ethnicity       | 248 (97.3)       | 360 (97)          | 156 (76.8)        | <0.001 (<0.001)   |
| Minority ethnicity       | 7 (2.7)          | 11 (3)            | 47 (23.2)         |                   |
| **Smoking**              |                  |                   |                   |                   |
| Non-smoker               | 155 (60.8)       | 207 (55.8)        | 123 (60.6)        |                   |
| Former smoker            | 74 (29)          | 100 (27)          | 37 (18.2)         | 0.003 (0.017)     |
| Active smoker            | 26 (10.2)        | 64 (17.3)         | 43 (21.2)         |                   |
| **Preoperative level of function and symptoms** |          |                   |                   |                   |
| Walking aid outside the home | 198 (77.6)    | 273 (73.6)        | 119 (58.6)        |                   |
| None                     | 35 (13.7)        | 55 (14.8)         | 41 (20.2)         |                   |
| One cane                 | 11 (4.3)         | 12 (3.2)          | 10 (4.9)          | 0.005 (0.002)     |
| Two canes                | 10 (3.9)         | 27 (7.3)          | 32 (15.8)         |                   |
| Wheeled walker housebound| 1 (0.4)          | 4 (1.1)           | 1 (0.5)           |                   |
| Oxford knee score, mean ± SD | 24.6 ± 8        | 23.8 ± 8          | 21.5 ± 8          | <0.001 (<0.001)   |
| Knee pain during activity1, median (range) | 59 (0.099) | 63 (0.100) | 67 (0.100) | <0.001 (0.002) |
| Quality of life before surgery1, median (range) | 45 (0.100) | 47 (0.100) | 50 (0.100) | 0.634 (3.171) |
| Level of symptoms before surgery1, median (range) | 51 (0.100) | 50 (0.100) | 50 (0.100) | 0.634 (3.171) |
| **Preoperative expectations** |                   |                   |                   |                   |
| Expectations to knee pain caused by use of hip 1 yr after surgery1, median (range) | 4 (0.95) | 2 (0.96) | 2 (0.100) | 0.003 (0.008) |
| Expectations to quality of life 1 yr after surgery1, median (range) | 90 (0.100) | 94 (0.100) | 96 (0.100) | <0.001 (0.002) |
| Expectations to level of symptoms 1 yr after surgery1, median (range) | 4 (0.82) | 2 (0.99) | 2 (0.99) | <0.001 (0.001) |
| **Postoperative level of function and symptoms** |          |                   |                   |                   |
| Knee pain during activity, Post-OP1, median (range) | 12 (0.090) | 20 (0.100) | 26 (0.097) | 0.002 (0.006) |
| Quality of life after surgery1, median (range) | 77.5 (13.9:98.0) | 70 (0.100) | 69 (0.100) | 0.035 (0.219) |
| Level of symptoms after surgery1, median (range) | 21 (0.940) | 23 (0.100) | 31 (0.095) | 0.182 (0.728) |
| **Difference in outcomes** |                   |                   |                   |                   |
| Difference in Pain1, median (range) | 8 (-11.840) | 15 (-90.100) | 21 (-48.970) | 0.012 (0.069) |
| Difference in Quality of life Post-OP1, median (range) | -7 (-67.095) | -20 (-100.098) | -18 (-99.098) | 0.003 (0.017) |
| Difference in level of symptoms1, median (range) | 15 (-14.089) | 17 (-56.0100) | 18 (-41.095) | 0.532 (3.193) |

1Visual analogue scale 0-100. BMI: Body mass index.

have lower pre-OP symptoms. African Americans have been found to be less knowledgeable regarding OA, to have a lesser understanding of the risks and benefits of surgery compared to White Americans30,31, and to have a lower preference for surgical treatment.25. This could explain our finding of more severe pre-OP symptoms in patients of minority ethnicity, as patient preference has been associated with referral from GP to orthopaedic evaluation in OA patients.25, Many American-based studies report that minorities are more likely to undergo surgery at low volume hospitals and that this is a cause for poorer outcome. This does not apply in Denmark, as most patients are treated in the public system and all our data are based on patients treated in one high-volume public institution. Severity of pre-OP symptoms has been shown to influence outcome.24,6 Although our post-OP response rate was too low to make any conclusions, we did find that the overall outcome for patients born outside the country was poorer compared to patients born in the country, which is concurrent with the reportings of Krupic et al25. Similar findings have been reported in American patients, where minorities are reported to have a higher post-OP complication rate, mortality and longer hospital stay compared to white Americans.25,26.

The duration of education is key to how individuals seek and handle information,32, and therefore important with regard to how patients cope with medical treatment. We found that patients with > 12 years of education had more severe pre-OP symptoms than those with shorter educations. This result is not concurrent with findings in previous studies, as these have found more severe symptoms in patients with shorter education; an educational level less than high school in the United States has been associated with greater pre-OP pain and lower function in TKA patients by Lopez-Olivo et al.33. Although we found significant P-values
previously been found to be a predictor for better post-OP outcomes by Greene et al\textsuperscript{[13]}, while others report no significance\textsuperscript{[34]}. We found that patients with short educations reported a lower post-OP pain severity (MCID below cut-off level), and could find no other significant influence of education on other outcome parameters. Although statistically significant, Greene et al\textsuperscript{[13]} also found very small differences that were not clinically relevant. It is thus uncertain whether education can be used as an outcome predictor for TKA patients. Combined with our low response rate, no findings regarding education and post-OP outcome were convincing.

Our study has several limitations, as this is a purely descriptive and hypothesis-generating study. External validation is a major limitation for our study, as both ethnicity and education differ between countries. Education differs greatly across the world; we have, however, tried to accommodate this by dividing patients into three groups based on their number of education years rather than completed degrees. Ethnic minority groups within a country are of course different across the world. In this study, we try to address the issues that arise in healthcare for people born outside their residential country and not the health care behaviour of specific ethnic groups. We believe that our results can contribute to the knowledge base for how to approach racial disparities within a population.

Our results are based on regression analysis, adjusting for patient-related factors such as gender, smoking, alcohol consumption, co-morbidities, symptoms, self-reported QoL and expectations as shown in the Tables. Residual confounders include the missing evaluation of radiologic status/alignment. Surgical factors have been shown to influence patient satisfaction in other studies, and this is unaccounted for in our study; however, all patients were treated by the same high-volume surgeons in a well-defined fast-track setup with standardized treatment for pain, mobilisation and post-OP care, as described in the Methods section\textsuperscript{[11]}. All treatments in Denmark are free of charge, and therefore socioeconomic factors do not affect the choice of implant in our population. Only 44.6% of patients responded to our post-OP questionnaire, and response rate was even lower for patients born outside the country (26.2% vs 46.2% for patients born in the country). We therefore make no conclusions regarding significance of either ethnicity or education on post-OP measurements. In this study, we have only evaluated results based on patient-reported outcome measures, and not other outcome measures such as the length of hospital stay, infection rate or other complication rates.

In conclusion, minority ethnicity and duration of education influence pre-OP disability and expectations in patients undergoing TKA. This should be taken into account when patients are advised pre-operatively.

**ARTICLE HIGHLIGHTS**

**Research background**

The background, present status, and significance of the study should be described in detail. It is known that patient-related factors, socioeconomic factors and education influence patient outcomes in general, however this area is difficult to investigate and thus these factors are often confounding in scientific work. These factors are also known to be of significance in patients scheduled to undergo total knee arthroplasty (TKA), and this study provides information regarding the significance of education and ethnicity in these patients.

**Research motivation**

During recent years, a trend towards optimized care, standardized patient evaluations and fast-track surgery has been influencing orthopaedic surgery. Although beneficial in many ways, this concept may not be appropriate for all patients. Levels of education and ethnicity is known to influence patients, and understanding the significance of these factors in TKA patients will assist healthcare providers in optimizing treatment plans for individual patients.

**Research objectives**

The objectives of this study were to determine if level of education and ethnicity influence the preoperative status of patients undergoing primary TKA or patient expectations for surgery. The significance of ethnicity and level of education on outcome following TKA is still uncertain and should be an objective for future research.

**Research methods**

We prospectively included 829 patients undergoing TKA. Patients filled in pre-operative questionnaires with information regarding place of birth, duration of education, expectations for outcome of surgery and baseline characteristics. Statistical analyses were performed to identify the significance of ethnicity and level of education.

**Research results**

We find that patients undergoing TKA in a country different to where they were born report more severe preoperative symptoms and lower expectations for postoperative outcome. We also found that patients with a longer duration of education report more severe pre-operative symptoms. We found that patients of minority ethnicity and with an education > 12 years had more severe symptoms post-operatively. However, due to a low response rate, we cannot draw generalizable conclusions about these results. The significance of ethnicity and education on post-operative results remain to be sufficiently described.

**Research conclusions**

Minority ethnicity and duration of education influence preoperative disability and expectations in patients undergoing TKA. Patients undergoing TKA in a country different to where they were born need individualised evaluation to accommodate potential differences from the general patient population. Patients of minority ethnicity report more severe pre-operative symptoms before undergoing TKA and lower expectations for post-operative outcome. Patients with educations longer than 12 years report more severe symptoms before undergoing TKA. Minority ethnicity and duration of education influence preoperative disability and expectations in patients undergoing TKA. Ethnicity and education influence patients’ perception of disease. Socioeconomic factors should be considered when evaluating patients.

**Research perspectives**

Our study provides knowledge regarding the significance of ethnicity and education on preoperative disability and expectations of outcome. This information is key for healthcare professionals when evaluating patients prior
Ibrahim SA. Racial and ethnic disparities in hip and knee joint replacement: a review of research in the Veterans Affairs Health Care System. *J Am Acad Orthop Surg* 2007; 15 Suppl 1: S87-S94 [PMID: 17766799 DOI: 10.5435/00124635-200700001-00019]

Hankins FH, American Sociological Association. American Sociological Review. Vol 60. American Sociological Society; 1995

Lopez-Olivo MA, Landon GC, Siff SJ, Edelstein D, Pak C, Kallen MA, Stanley M, Zhang H, Robinson KC, Suarez-Almazor ME. Psychosocial determinants of outcomes in knee replacement. *Ann Rheum Dis* 2011; 70: 1775-1781 [PMID: 21791452 DOI: 10.1136/ard.2010.146423]

Noiseux NO, Callaghan JJ, Clark CR, Zimmerman MB, Sluka KA, Rakel BA. Preoperative predictors of pain following total knee arthroplasty. *J Arthroplasty* 2014; 29: 1383-1387 [PMID: 24630598 DOI: 10.1016/j.arth.2014.01.034]

P- Reviewer: Lin JA, Surace MF  S- Editor: Cui LJ  L- Editor: Filipodia  E- Editor: Song H
