

Current Status and Position of Orthotics and Prosthetics Education-Its Challenges and Issues

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ABSTRACT

Background of the study: Prosthetics and orthotics are essential for individuals with physical limitations as they provide solutions that promote mobility and independence. Like many other places in the world, Punjab Pakistan also has its share of issues in the ever-changing landscape of healthcare including increasing need for Orthotics and prosthesis due to rise in chronic illnesses and age. This study looks at current state and issues of Punjab Pakistan's orthotics and prosthetics industry using educational challenges encountered by students and professionals. This study also investigates the areas of education in which improvement is significant.

Methodology: A comparative cross-sectional study was conducted on a sample of 140. Modified questionnaire was designed. SPSS version 20 had been used.

Results: A total of 39 (56%) students find their orthotics prosthetics and biomechanics course difficult to understand while 15

(22%) students consider these subjects easy. 44 (63%) students considered expenses of education as an economic burden only 13 (19%) can bear the expenses. Satisfaction related to course outline was 39 (56%). students were positive about their courses while when asked whether you considered your curriculum meet international standards, 30 (43%) students agreed, 31 (44%) disagreed.

Conclusion: It is concluded that professionals' and students' access to and delivery of orthotics and prosthetics education was restricted by factors such as a lack of funding, infrastructure, and faculty expertise. There are also areas that need improvement, like curriculum updates, opportunities for practical training, and partnerships with organizations.

Keywords: *Prevalence, Cross-sectional studies, Orthotics, Prosthetics, Education, Rehabilitation,*

INTRODUCTION

People with physical impairments or functional restrictions can live healthy, productive, independent, and dignified lives. With the help of orthoses and prostheses, they can engage in school, the labor market, and social activities. Prostheses are artificial replacement of body part while orthoses are braces and splints. Using orthoses or prostheses may reduce the need for support services and medical treatment. People who require prostheses or orthoses are frequently

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left alone and unproductive when they lack access to them, which raises the burden of sickness and disability. It has been projected that by 2035; there will be 125 million disabled people in low-income nations that require rehabilitation services¹. Acquiring enough expertise to function as a healthcare practitioner is vital. However, in developing countries like Pakistan only a few institutes provide courses on orthotics and prosthetics at undergraduate or postgraduate level². Rehabilitation services are in high demand due to the rising number of disabled people in society. About 80% of people with disabilities live in developing nations, such as Pakistan³. The prevalence of disability in Pakistan has increased the need for a top-notch orthotics and prosthetics rehabilitation education program. Numerous obstacles hinder the educational and professional development of orthotics and prosthetic students and graduates in Pakistan particularly in province of Punjab. Moreover, Pakistan's medical facilities, grants, and infrastructure are often lacking⁴. The purpose of study is to find out what difficulties do students and professionals in the fields of orthotics and prosthetics currently face in their education and practice, and how do these difficulties affect clinical training, professional development, academic learning, and recognition in the healthcare system. There is an absence of recognized training programs in orthotics and prosthetics, which contributes to a deficit of skilled workers in the industry. Furthermore, a lot of educational institutions lack the tools and infrastructure needed for practical instruction, which leaves students with a restricted amount of academic knowledge along with hands-on training. The main challenges are lack of funding for facilities and equipment for research, limited opportunities for continuing education, and a lack of expertise in applied biomechanics⁵. One of the most important components of Orthotics and Prosthetics education programs is the practical placement, which offers the chance to develop professional and clinical skills and put theory into practice. However, the hardest and challenging part of the undergraduate program is typically considered to be the practical placement. Assuming a new placement might be intimidating, so it's important to make sure the student has adequate assistance. If students receive appropriate guidance and training at the initial stages, they will be equipped to learn and work during their placement⁶. In Pakistan's province Punjab there is significant competition in the orthotics and prosthetics field with only a few jobs available, making it extremely difficult to find a good job after graduation⁴. Despite having a vital role in patient care, orthotists and prosthetists may struggle to gain respect and recognition within the healthcare system. They might therefore make less money and have fewer opportunities for career advancement than other healthcare professionals. Inadequate infrastructure is another major barrier to students' educational experiences. Inadequate labs and medical facility equipment results in less opportunities for experiential learning and hands-on training. Clinical learning, which is carried out under a teacher's supervision not only give clinical experience but also improve the necessary skills through observation, participation and treatment plan application while taking into account all clinical considerations while without access to contemporary tools and resources, practitioners might not have the self-assurance and knowledge needed to give patients high-quality care in healthcare settings⁷. The lack of unified and uniform curriculum also results in challenges and issues faced by students. Improving manufacturing efficiencies will allow greater curricular emphasis on clinical training and education, an area that has traditionally been underemphasized⁸. Probably the most crucial yet frequently overlooked factor in improving clinical decision-making and orthotics and prosthetics curriculum is evidence-based practice. More coursework on the discovery, retrieval, assessment, interpretation, and integration of new scientific knowledge ought to be added to this area of the curriculum. Students will learn how to evaluate and characterize patient outcomes for values-based care, apply a systematic approach to patient care, and use data to support up their conclusions. Values-based care and evidence-based practice are currently popular trends that this strategy aligns with and is likely to continue⁹. The learning experience for students would be further improved by increasing the quality of clinical placements and adding more practical components to the curriculum¹⁰. There is an absence of research on prosthetic and orthotics education. Enhancing research on prosthetics

education can be achieved through disciplinary support for orthotics and prosthetics education, academic collaborations, and journals dedicated to education. There is currently not enough literature available to instruct and guide future orthotics and prosthetics students¹¹. Moreover, there is lack of more effective biomechanical devices which are critical for evaluating and creating effective orthotics and prosthetics solutions¹². An organizational framework for undergraduate research training in orthotics and prosthetics education, highlighted the need for structured research opportunities to enhance students' learning experience and professional growth in the field. Overall, it is need of hour to address the issues in orthotics and prosthetics education by means of innovative instructional strategies, advanced curriculum, ongoing professional development, and organized research opportunities. Instructors and educational institutions can better prepare students for promising careers in the orthotics and prosthetics discipline by putting these recommendations into practice¹³. There is barely any research in Punjab, Pakistan that thoroughly examines the various difficulties encountered by professionals and students working in the orthotics and prosthetics fields. The majority of current research concentrates only on technical or clinical outcomes, ignoring important topics like curriculum relevance, deficiencies in practical training, lack of professional recognition, and lack of coordinated advocacy. By examining these problems all at once, this study closes a big gap and offers insightful information about the structural flaws in orthotics and prosthetics education and practice in Punjab, Pakistan. So, the purpose of study is to find out what difficulties do students and professionals in the fields of orthotics and prosthetics currently face in their education and practice, and how do these difficulties affect clinical training, professional development, academic learning, and recognition in the healthcare system.

METHODOLOGY

A comparative cross sectional study was conducted with sample size of 140 (n = 140) divided into two groups. One group contains 70 students of final semester while other contain 70 professionals. The modified questionnaire was designed, based on similar research conducted in other countries, such as Ghana, Togo, and Japan^{2,5,10,12}. The original questionnaire is provided at the end of the article for reliability and validation purpose. The questionnaire was approved by the ethical committee of the Department of Orthotics and Prosthetics, Government College University Faisalabad. The questionnaire was split into two sections having a total of five (5) categories, two (2) categories were for the students, two (2) categories were for the professionals and one (1) category was common among students and professionals, which was answered separately by both groups. The modified version of the questionnaire was circulated among the students enrolled in different government and private institutes and, also among professionals. The questionnaire was spread to the candidates by email, Google Docs, and in-person after the guidelines which were provided over the phone, with questions explained as needed. Male and female participants between the ages of 18 and 35 who are connected to the government sector comply with the study's inclusion requirements. Participants must be either professionals working in the field or students enrolled in orthotics and prosthetics programs, and they must give their informed consent to participate. Private sector workers, those who refuse to participate, and technicians or lay professionals without formal training or credentials in orthotics and prosthetics are among the exclusion criteria. A consent note that was included at the start of the questionnaire told participants about the goal and details of the study. The questionnaire was only completed by those who voluntarily consented to participate, demonstrating their informed consent. All participants' privacy was rigorously protected; no personal information was gathered, and the information was only utilized for study. To protect privacy and data throughout the study, all answers were kept private and anonymous. The results were not subjected to any statistical tests; rather, they were

simply gathered into tables using SPSS and evaluated through graphical representations. Data was compiled and analyzed by SPSS 20.0 and MS Office 2017.

RESULTS

The data in this study were not subjected to any statistical tests. SPSS software was used to organize the data into tables, after the questionnaire responses were entered. The frequency and distribution of responses were the main subjects of the descriptive analysis. Graphs were then used to visually represent the results in order to improve comprehension and interpretation. Tests of significance or group comparisons were not included in the study since no inferential statistical techniques were applied. Descriptive results obtained straightaway from the gathered data were used as the foundation for the entire analysis, hence there were no non-significant findings.

Category 1: Study Related Challenges

A total of 39 (56%) students out of 70 find their orthotics prosthetics and biomechanics course difficult to understand while only 15 (22%) students consider these subjects easy. Due to high fees of this field, 44 (63%) students considered expenses of education as an economic burden only 13 (19%) can bear the expenses. When students were asked question related to attending seminars and conferences or access to educational materials, there were mix responses. When students were asked about satisfaction related to course outline, 39 (56%) students were positive about their courses while when asked whether you considered your curriculum meet international standards, 30 (43%) students agreed and 31 (44%) disagreed.

Table 4.1: Study Related Challenges

Questions	Agree	Partially Agree	Neutral	Partially Disagree	Disagree
I find my prosthetics, orthotics, and biomechanics course difficult to understand	20	19	16	9	6
I consider the expense of prosthetics and orthotics education to be an economic burden	29	15	13	7	6
I attend seminars and conference related to my field	19	10	9	7	25
I believe I have sufficient access to books, journals and articles in my field of study	13	18	13	7	19
I am satisfied with my course outline	20	19	8	5	18
I believe that our curriculum meets the international requirement	19	11	9	10	21

Category 2: Practical Application Challenges

When it came to performing practical work, 32 (46%) out of 70 students denied that statement that they got enough time to do practical work. A majority of 42 (60%) students answered that they did not receive enough practical instruction or workshop experience at their institute. When students were asked whether you were confident that you could find a job after graduation, 37 (53%) were not sure about job placement. A vast majority of students (83%) believed that clinical practice should start from initial years of university.

Table 4.2: Practical Application Challenges

Question	Agree	Partially Agree	Neutral	Partially Disagree	Disagree
I perform practical work frequently	14	13	11	10	22
I receive enough practical instruction and workshop experience at our institute	6	10	12	11	31
I am confident that I can find a job following graduation	11	12	10	11	26
In my opinion clinical practice should start from the initial years of university	51	7	5	1	6

Category 3: Students & Professionals Common Challenges (Students)

When it came to professionalism, a vast majority of students (72%) believed that orthotics and prosthetics field lacks professionals. Almost 83% were opinion that there is lack of infrastructure and facilities to do hand on trainings. Similarly, 57 students believed that theory and practice should be combined. When students were asked about whether they were given guidance regarding field from teachers or professionals, 35 (50%) students answered that they received enough guidance while only 20 (29%) negate the statement. About 33 students believed that other medical professionals related to orthotics and prosthetics were not sufficiently aware of field and while working in different orthotic and prosthetic workshops 48 out of 70 students felt a clear gap between theory and practical.

Table 4.3: Students & Professionals Common Challenges (Students)

Questions	Agree	Partially Agree	Neutral	Partially Disagree	Disagree
I believe that the discipline of orthotics and prosthetics lacks professionals	34	16	11	7	2
I feel that there is a lack of infrastructure and facilities	44	14	6	4	2
Theory and practice need to be combined	53	4	9	4	0
I receive sufficient guidance form orthotics and prosthetics personals/teachers	18	17	15	6	14
Other medical professionals are sufficiently aware of my specialty	16	10	11	13	20
While working at workshop I clearly feel a gap between theory and practical	31	17	16	3	3

Category 3: Students & Professionals Common Challenges (Professionals)

When questions related to field and practices were asked from professionals 57 (81%) out of 70 were of opinion that our field lack professionals. It was because they (68 out of 70) believed there was lack of infrastructure and facilities due to which most of graduates did not get opportunity enter professional life. Moreover, about 97% (68 out of 70) emphasized that theory and practice should be combined for better future of upcoming graduates. When question related to guidance was asked 63% (44 out of 70) responded that they received adequate guidance from professionals. About 49% of professionals agreed that other medical professionals recognize their field while 42% disagree with the statement. Lastly, when they were asked about gap between theory and practical work almost 86% professionals felt a clear gap between theory and practical work.

Furthermore, if when we compared responses by students and professionals, we came to know the professionals gave very clear cut response without any “ifs and buts

Table 4.4: Students & Professionals Common Challenges (Professionals)

Questions	Agree	Partially Agree	Neutral	Partially Disagree	Disagree
I believe that the discipline of orthotics and prosthetics lacks professionals	38	19	7	1	5
I feel that there is a lack of infrastructure and facilities	63	5	0	1	1
Theory and practice need to be combined	67	1	1	1	0
I receive sufficient guidance form orthotics and prosthetics personals	25	19	13	6	7
Other medical professionals are sufficiently aware of my specialty	15	19	7	6	23
While working at workshop I clearly feel a gap between theory and practical	50	10	4	1	5

Category 4: Post graduation Education, Training & Career Advancement

When questions related to continuous education and training were asked 74% (52 out of 70) continued training after graduation while 77% (54 out of 70) stated that there weren’t enough postgraduate programs in the field. When it came to job placement 66 (94%) found it hard to get a job specially in government sector and 51 (73%) thought that it was hard to advance their career as an orthotist and prosthetist. When question related to government support or assistance was asked, 41 (58%) professions didn’t think that government was doing anything to assist professionals to achieve their goals while only 19 (27%) give positive response. Lastly when technology related question was asked 61 (87%) professionals agreed that they were still using old school ways rather than new technologies.

Table 4.5: Post graduation Education, Training & Career Advancement

Questions	Yes	No	Not Sure
After graduation, I continued further training	52	14	4
There aren’t enough postgraduate programs in orthotics and prosthetics	54	12	4
I had trouble finding job opportunities in this field especially in government sector	66	3	1
It was difficult for me to advance my career as an orthotist and prosthetist	51	10	9
The government is assisting experts in the field of orthotics and prosthetics to achieve their goals	19	41	10
I think that traditional methods are still being used and modern technologies are not being utilized	66	0	4

Category 5: Advocacy for PNOs' Recognition & Unity

Out of 70, 47 (67%) professionals were of opinion that other healthcare professionals didn't acknowledge/know their field due to which patient outflow is less than expected and 41 (59%) thought that this field made less money overall in comparison to other healthcare professionals. Moreover, as this field is still in its evolution phase and not a single platform for all professionals to share their knowledge, so about 35 (50%) believed that there was no unity among professionals of field. Similarly, about 63 (90%) answered that there was not a single authority acting for check and balance in field. When it came to standard of education 42 (60%) professionals believed that Punjab's Orthotists and Prosthetists were not qualified according to international standards and in the same way, 38 (54%) answered that there were no NGO's funding for recognition and betterment of field.

Table 4.6: Advocacy for PNOs' Recognition & Unity

Questions	Yes	No	Not Sure
Other healthcare professionals don't sufficiently acknowledge/know my field	47	12	11
Orthotics and prosthetic professionals make less money overall than other healthcare professionals	41	19	10
There is unity among orthotics and prosthetics professionals	26	35	9
There is no authority that is acting as a check and balance in my field	63	3	4
Orthotists and prosthetists in Punjab are qualified according to international standards	16	41	13
There is a lack of NGO's who are funding for recognition and betterment of our field	18	38	14

DISCUSSION

Education in orthotics and prosthetics (O&P) is essential for training professionals who improve the lives of people with physical disabilities. Worldwide demand for the prosthetics and orthotics is very high¹⁴. The field is important, but is facing many obstacles particularly in Punjab Pakistan, that prevent it from progressing. In this research we discuss results from viewpoint of professionals and students from various institutions of Punjab Pakistan. These results are interpreted in context with previous studies conducted in Ghana, Togo, Japan and African countries like Sierra, Leone and Malawi^{5,10,12,15}. It also looks at how these factors might affect future research and practice. Students pursuing degrees in orthotics and prosthetics face a number of obstacles in their academic careers. One of the biggest challenges is understanding course outlines, especially for advanced topics like biomechanics. The complexity of the subject matter or the absence of efficient teaching strategies could be the cause of this difficulty. The students reported challenges in Ghana related to lack of teaching materials in P&O and biomechanics¹². Additionally, students' difficulties are made worse by the cost of orthotics and prosthetics education. This sector can be less accessible and diverse in the workplace if people are discouraged from seeking education in it by the expensive tuition, books, and specialist equipment. The majority of respondents in Ghana reserach were middle-aged and had a strong desire to advance their knowledge in the Orthotics and Prosthetics field. Still, it remained difficult for them to advance their skills due to a lack of funding and the lack of regional graduate programs in the country¹². Students frequently face difficulties not only in the classroom but also while attempting to apply their theoretical knowledge in real-world situations. This problem gets worse by a lack of opportunities for practical experience and inadequate guidance. Insufficient exposure to real-world situations and clinical environments

could deprive students of the self-assurance and abilities needed to succeed in their future professions. Expanding the number of clinical placements and including more hands-on components in the curriculum would enhance the students' learning experience even further¹⁰. Furthermore, students worry about their employability after graduation due to the perceived disconnect between academic preparation and job readiness. To close this gap and better prepare students for careers in orthotics and prosthetics, many argue that clinical practice should begin early in their university careers. This field is becoming oversaturated with unemployed PNO's because there aren't enough jobs for recent graduates⁴. Students in the field of orthotics and prosthetics are not the only ones who face difficulties; practitioners face several difficulties on a daily basis. The perceived lack of skilled workers in the industry, together with lack of facilities and infrastructure, is a frequent source of worry. This insufficiency puts a strain on practicing physicians as well as lowering the standard of patient treatment. Better orthotics and prosthetics rehabilitation programs can improve movement and user satisfaction while reducing healthcare expenses¹⁶. Furthermore, there is broad agreement among professionals and students alike regarding the necessity of closer integration between theory and practice in clinical and educational settings. The lack of guidance from orthotics and prosthetics personnel worsens this issue by preventing the development of useful skills and abilities. Kogler and his colleagues in 2021 outline the important role of academia in shaping the orthotics and prosthetics profession and preparing for its future⁸. The lack of awareness of other medical professionals regarding specialty of orthotics and prosthetics is another problem. If PNOs are not acknowledged and supported by their interdisciplinary colleagues, they may find it challenging to collaborate effectively with others in cross-disciplinary healthcare teams. Beyond merely completing an undergraduate degree, postgraduate students face obstacles in their pursuit of career advancement in the orthotics and prosthetics industry. Opportunities for professional development and career advancement are limited due to a lack of specialized education and ongoing training. There is no awareness or acknowledgement in the government sector⁴. Moreover, the lack of postgraduate programs that focus exclusively on orthotics and prosthetics complicates this issue by providing graduates with few opportunities to continue their education and acquire advanced expertise. Similar results were seen in the study conducted in Ghana where not a single participant holds postgraduate degree¹⁰. Finding a job is a significant barrier for PNOs, particularly in the public sector. Inadequate government initiatives and support, limits the opportunities for professional development and obstruct career advancement. Moreover, the persistence of outdated methods in the field of prosthetics and orthotics restricts innovation and the adoption of improved and more effective patient care approaches. Technical proficiency is not the primary issue in this field's practical application; rather, it is the rapid advancement of technology⁴. Finally, there are general problems with the unity and acceptance of prosthetists and orthotists within the framework of healthcare. Despite the fact that PNOs are essential in helping individuals with mobility impairments to live a better life, other medical professionals frequently overlook and disrespect PNOs. Offering holistic orthotics and prosthetics care requires collaboration with other healthcare providers, but this collaboration is frequently impeded by a lack of recognition¹⁷⁻¹⁹. Moreover, it is also challenging to ensure high-quality care and practitioner accountability due to the absence of regulatory authorities or other strong institutions to monitor and enforce the specialty standards. In the field of orthotics and prosthetics, there is no regulatory authority to check and balance standards⁴. In order to tackle the numerous obstacles and issues concerning orthotics and prosthetics education, collaboration between educators, practitioners, policymakers, and stakeholders is mandatory²¹⁻²³. By identifying and resolving these issues, the field can get closer to fulfilling international standards, improving patient outcomes, and improving the recognition and unity of orthotists and prosthetists within the broader healthcare community. More international recognition and support are required to advance the orthotics and prosthetics profession worldwide²⁴⁻²⁷.

It is important to recognize the sample limitations of this study. The findings may not be as broadly applicable to other areas because the data were only gathered from inside the Punjab province. Further limiting the range of viewpoints reflected in the study is the exclusion of orthotics and prosthetics technicians from the sample. Additionally, the participant sample was limited to professionals and final-year students between the ages of 18 and 35; those who were younger or less experienced were not included. Considering these restrictions, neither the data gathering nor the analytic method found any significant potential biases. Also, there were no confounding factors in the study that might have affected the findings. No statistical tests were applied on the data, and the study was purposely kept simple and descriptive in nature. Rather, the emphasis was on using tables and graphical representations to clearly present the data.

CONCLUSION

Orthotics and Prosthetics education is at present struggling with some significant issues that both professionals and students must deal with. These issues include gap between theory and practice, lack of well-furnished labs, no uniform curriculum, lack of access to books, journals and articles related to field, lack of unity among professionals, limited opportunities in continuation of further education, no job opportunities in government sector, PNO's not well recognized as other healthcare professionals, low salary packages and lack of NGO's who work for recognition and betterment of field. To address these issues, we need to use a variety of strategies, including more funding, enhancing practical training, streamlining the acquisition of resources, providing better career support, constructing improved infrastructure, spreading awareness, establishing guidelines, and collaborating with organizations. By embracing these challenges, we can advance the field and improve conditions for those who wish to assist individuals with physical disabilities.

RECOMMENDATIONS

Based on study findings, following recommendations are proposed,

- Provision of free of cost internships for students
- Modifying course outlines according to international standards
- Arranging seminars and conferences related to field
- Diversifying career path for new graduates
- Investment in bringing up latest technologies
- Getting subscription of virtual libraries and other online resources
- Providing more seats to PNO's in government hospitals
- Provide funding for betterment and recognition of respective field
- Provision of labs in universities along with trained staff
- Decreasing the cost of education
- Build society at national level and affiliation with Higher Education Commission (HEC)

AUTHORS' CONTRIBUTION:

The following authors have made substantial contributions to the manuscript as under:

Conception or Design: Ayesha Zaheer

Acquisition, Analysis or Interpretation of Data: Ayesha Zaheer, Benish Ali, Armughan Anjum

Manuscript Writing & Approval: Ayesha Zaheer, Benish Ali

All authors acknowledge their accountability for all facets of the research, ensuring that any concerns regarding the accuracy or integrity of the work are duly investigated and resolved.

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