Research article

Facilitators and barriers to learning faced by female students with disability in higher education

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ABSTRACT

This study was aimed to investigate the learning experiences' facilitators and barriers that is encountered by the physically disabled female students during their higher education. Twenty semi-structured interviews were conducted with female students with physical disabilities aged between 19 and 33 years. Interviews were transcribed, confirmed, and analyzed after being recorded. The average age of the sample was 22.15 ± 3.48 years and one-fourth of the participants' disability was due to cerebral palsy and 35% participants used wheelchairs. All the factors promoted inclusive education and equal opportunities for both disabled and nondisabled students. This study reveals that in order to improve the learning experiences of students with disabilities (SwD) and to give them more opportunities for success, it is important to consider all the barriers discussed in this study. It can be concluded that high effort is required to transform the higher educational institutions to be more accommodating for students with disabilities.

1. Introduction

The UNESCO summit in Salamanca (1994) had an impact on cultural ideas, policy, and practice in addition to education [1]. In the present, it still serves as a crucial point of reference for everyone fighting for inclusive education. Education institutions and professionals are undergoing a dramatic transition as a result of this legacy, which is firmly rooted in the digital era. As indicated by various international pronouncements [2], a more inclusive nature is being requested from the university within the framework of the European Higher Education Area. Additionally, the Sustainable Development Goal (SDG) on education of the Vision 2030 asks for encouraging opportunities for lifelong learning for everyone by 2030 as well as guaranteeing an inclusive and equitable quality education. It underlines the significance of fairness and inclusion as the cornerstones of high-quality teaching and learning [2].

According to the previous literature and statistical reports, people with disabilities generally experience discrimination, inequality, and access barriers to fair and equitable opportunities, such as those for education (UNESCO 2019). One of the newest conventions in

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the subject of human rights is the Convention on the Rights of Persons with Disabilities (UN 2006). The convention, which was only adopted in 2007, underlined that people with impairments have the same rights as everyone else (UN 2006). The convention did not define disability specifically, but the first article stated that people with disabilities are those who have physical, sensory, mental, or multiple limitations, such that the presence of environmental obstacles constitutes a barrier or an obstacle that prevents them from participating fully and effectively in society in a way that is equal to others, and Article 24 of this Convention affirms the right of persuasion (UN 2006). The ratification by 98 countries and the signing by 147 nations both attest to the broad international acceptability of the texts and content of this agreement. The increasing number of students with disabilities (SwD) currently enrolled in universities [3] demonstrates a qualitative shift in the worldwide perspective of this group of people, but it is still underrepresented [4].

The Ministry of Education of Saudi Arabia's official reports state that the Education Strategy 2016–2020, along with the National Transformation Program 2020 and the National Strategy for the Development of General Education, establishes a comprehensive framework to guarantee high-quality, inclusive, and fair education for all individuals in society [5]. These initiatives prioritize the promotion of equal opportunities, support systems, and customized approaches to meet the various needs of students, including those with disabilities. They also contribute to the overall development and advancement of the nation [6].

Several higher education institutions in various nations are required by law to make internal adjustments and at various levels to accommodate the needs of students with disabilities (SWD) and improve their educational experience [7–14]. University infrastructures [15], learning, teaching, and assessment strategies [16–18] accessibility to adaptive technology [17,19] services provided, and information access are all modified [15]. However, the internal modifications and levels of accommodations differ not only between institutes within the same country but also between countries [4,12,20]. Lack of ramps for wheelchair users, uneven pavements, out-of-service elevators, and inaccessible bathrooms were a few of the identified infrastructure issues that SwD encountered [8,20,21]. The educational experiences of students were also greatly impacted by the unavailability of study materials in alternative forms, academic faculty members' lack of expertise in teaching SwD, and the flexibility of programs [12,22]. Although some colleges have access to adaptive technology, SwD have trouble using it since either it needs special training to use, or the program needs to be updated frequently [23]. Another difficulty for SwD is social contact. According to [8], SwD in higher education feel underrepresented, marginalized, and disempowered.

Female students with disabilities including those with physical disabilities (PD) may encounter more challenges during their studies than male students or those with other types of disabilities, despite the fact that there is a wealth of literature from various countries that explores the challenges faced by SwD in higher education institutions and how they affect their educational attainment [24]. According to Rousso's research, architectural inaccessibility of buildings is frequently viewed as a significant barrier for female students with disabilities. This is because women are less likely than men to ask for assistance, and their physical makeup makes it difficult for them to take chances and attempt to overcome obstacles [25]. Additionally, because to the nature of their disease, students with PD experience higher levels of anxiety than their peers, which negatively draws attention to them [7]. Few studies have examined the possibility that females with PD may have a major scholastic disadvantage because they experience "double prejudice" because they are both female and have a handicap [26–30]. Saudi Arabia has made strides in ensuring equitable access to education for all individuals, including females with disabilities. The Education Strategy 2016–2020 prioritizes inclusive education and the provision of high-quality education for all individuals, regardless of their gender or abilities [5]. However, studies examining the experiences of female students with PD in higher education are scarce, especially in Saudi Arabia (SA) [20,30,31]. However, understanding their experiences could help develop policies, procedures, and strategies that enhance their overall learning experiences in higher education in SA. According to the most recent disability survey (2017), SA has 1,445,723 persons with disabilities, or 7.1% of the total population. PD accounts for the biggest number (57.6%) among the other disabilities (29.13%), while females make up 55.15% of that population [32]. Females with disabilities in Saudi Arabia encounter a multitude of obstacles and limitations when it comes to obtaining education, securing employment, and participating in society. Based on the 2007 WHS Survey conducted by the Ministry of Health, it was found that older age groups have a higher prevalence of extreme disability [6,32,33]. This suggests that disability is a significant issue for females across various age groups in the country. Studies conducted on disability prevalence in Saudi Arabia indicate that females exhibit a higher prevalence of disabilities compared to males in all age groups. This discrepancy emphasizes the necessity for focused initiatives and support structures to tackle the distinct requirements and entitlements of women with disabilities in the nation. Therefore, this study was aimed to investigate the learning experiences' facilitators and barriers that is encountered by the female students during their higher education.

2. Methodology

2.1. Study design

It was a descriptive qualitative study. To collect comprehensive data, researchers conducted semi-structured, open-ended interviews with study participants who were female SwD.

2.2. Study participants

The Student with Disability Support Center at Princess Nourah bint Abdulaziz University was engaged to purposively sample students with PD. All SwD (n = 25) enrolled with the center received an email and a WhatsApp group invitation to participate in the study. The contact details of the SwD who volunteered were sought from the center, and the study was discussed thoroughly over a

telephonic conversation. Once the students gave their consent, an interview was scheduled at the time and place of choice of the volunteers.

2.3. Instrument

The semi-structured questionnaire was adopted from a previous study which was based on similar theme [34]. A total of 28 questions based on facilitators and barriers were designed by the authors to evaluate the quality of educational experience for female SwD. The questionnaire was reviewed by an expert, unrelated to this project, who made sure that the questions were relevant, and the desired information was effectively captured during the interview. The second review was done by an expert in psychometrics who made sure to eliminate the ambiguous, repeated, and confusing questions. The questionnaire validity was further ensured while conducting the interview, where one of the authors who is skilled and trained was chosen to moderate the interviews making sure to rule out any personal bias. Respondent validation was carried out on five SwD to confirm the extraction of expected data from their answers. These responses were also included in this study [35]. For the scripts of interview in English and Arabic language please refer to the Supplement 1.

2.4. Procedure

2.4.1. Ethical consideration
The Institutional Review Board (IRB) committee at Princess Nourah bint Abdulrahman University provided ethical approval for this investigation (IRB log number: 17–0198; IRB Registration number with KACST, KSA: H-01-R-059). All participants received a thorough explanation of the study's confidentiality management method and the fact that no mention of their personal information will be made in the study's published results. Participants were also informed that the interview would be recorded and that they had the option to leave at any time. To take part in the study, all individuals had to provide written informed consent. All information and recordings from the interview were preserved and secured in a coded system with the participants' privacy and anonymity guaranteed.

2.5. Data collection

An email invitation was sent to 25 SwD for a face-to-face or online (voice chat) semi-structured interview which was conducted by the same researcher for all participants to preserve consistency. A total of five online interviews and fifteen in-person interviews were conducted in the local language of the interviewee, i.e., Arabic which lasted between 30 and 45 min. Online interviews were conducted only for those students who were unable to arrive on the campus. An audio recorder was used to record all the interviews for later use of transcription.

The interviewer secured the participant's written informed consent before beginning the interview by outlining the primary goal of the investigation. A series of open-ended questions focusing on the facilitators and barriers were asked after collecting demographic information. The interviewer questioned participants about the facilitators' aspects before the barriers to foster a favorable environment [36]. For instance, the researcher interfered by asking the student, "What do you think about the assistance from academic and administrative staff?" when the student was unable to clearly respond to a question on the variables that assisted their learning experience in the university. Different types of prompts were used, such as physical prompts (university campus/classrooms/laboratories/transportation), social prompts (family/colleagues/academic and administration staff) and attitudinal prompts (flexibility of the program and assessment procedures/access to information/availability of devices and services for learning), to address a range of topics. Facilitators were the factors that facilitate/support/helped in learning experience as a SwD at the university. Whereas barriers were the factors that challenge/hinder in learning experience as a university SwD.

2.6. Translation of the questions and responses

Using a systematic forward and backward translation technique, the semi-structured questionnaire was translated into Arabic and confirmed before being used. The questionnaires were first translated from the English version to Arabic by a panel of three specialists who are fluent in both English and Arabic. A bilingual professional who was blind to the English version of the questionnaire's backward translations. The backward-translated English versions of both questions were evaluated by a professional simultaneous Arabic-English interpreter. The interview recordings were similarly translated into English for scientific writings.

2.7. Data analysis

The collection of data and its analyses were carried out simultaneously as the recordings were transcribed verbatim with notes following each interview. The participant's responses that were comprehensive and reflected the points of view of the other participants were selected and then translated into English. Thematic analysis was used to examine the responses of the participants. To assure the accuracy of the transcribed interviews, researchers first evaluated all the transcripts before sending them to the participants for review. The participants were also encouraged to change or add any information in the transcript related to the topic. To ensure accuracy, two researchers independently reviewed the transcripts and then compared and discussed. Furthermore, the codes were provided to each person who was included to ensure the data's confidentiality and anonymity. The authors next step was reading the interview transcripts line by line while looking for the identifier codes to understand the data. Step 3 entailed creating a coding table

with the initial codes, themes, and sub-themes for the facilitators (Table 2) and barriers (Table 3) in higher learning of the SwD. Step 4 involved all researchers returning to the interview transcripts and continuing to find themes and sub-themes after the authors' conversations about the interview data. The final themes and subthemes were determined in step 5 after the analyzed interviews were confirmed and discussed by all researchers. The quotations from the participants were examined and chosen as a last step to clarify the themes and sub-themes that had been identified (see Table 4).

2.8. Themes and subthemes of facilitators and barriers of learning in female SwD

Five sub-themes were used to study the facilitators of higher learning in female SwD. These themes were rooted in the initial codes deduced from the transcripts of interviews as shown in Table 1.

There were nine subthemes which were identified from the initial codes. These represented the barriers in higher learning of the SwD as shown in Table 2.

3. Results

3.1. Demographics of sample population

The results shown in Fig. 1 reveal a sample size of 25 SwD, of which 20 unique responses (80%) were included in this study. Five students were excluded due to incomplete interview or lack of consent.

The participants included in this study were diagnosed with PD related to several disorders such as cerebral palsy (25%), spina bifida (15%), and knee replacement (10%), hip dysplasia (10%) whereas each of the other disorders leading to PD represented 5% (Fig. 2A). Seven participants (35%) utilize wheelchairs to assist their movements whereas 50% of the participants used no assistive devices, also there were single users of orthopedic shoes, spine brace and knee brace each (Fig. 2B). The average age of the sample was 22.15 (SD = 3.48) years (Fig. 2C).

Only 5% of students were enrolled in each college of education, college of medicine, college of social work, deanship of preparatory year of health sciences and college of science. There were 3 students from each of them i.e., applied college, college of arts and college of business administration. Additionally, there were 2 students from each, the college of arts and design, college of computer and information science and deanship of community service and continuing education (Table 3).

The remaining of the results includes two major themes: facilitators and barriers in higher leaning of female SwD. These two themes are further subdivided into subthemes as illustrated previously in Tables 1 and 2.

3.2. Facilitators of higher learning by female SwD

There were five main sub-themes: proper infrastructure, positive social support, accessible transportation system, availability of student with disability support center and accessible electronic services.

3.3. Proper infrastructure

The infrastructure refers to the basic physical structures and facilities available at the university. Most of the participants of this study agreed on the infrastructure of the university as it was accessible and enhanced their quality of learning experience. The interview responses of these female SwD can be classified into four sub-themes as mentioned in Table 1.

Accessible elevators. Majority of the participants (85%) considered elevators in college buildings and student services buildings were a facilitator. They stated that the elevators are designed to with an insight of assisting the SwD as the lift's control panel, switches, and buttons are all placed at a lower height, *"The level of the elevator buttons is low, I can reach them." (P13)*, additionally, P10 averred *"It has a great space; I use it a lot at the university."*, which indicates the availability of wide space in the elevator cab.

Table 1
Interview schedule.

Interviewer	The interview was conducted by the same researcher for all participants
Place	Online or in a location agreed upon by the student and the researcher that is quiet with no interruption
Duration of interview	30–45 min
Interview process	Explanation, Questions, and prompts
Researcher introduction	Final-year doctor of physiotherapy student at PNU
Purpose of the study	To explore the facilitators and barriers to learning experience faced by female SwD in higher education.
Demographic data	Age - Specialty- Level of study - Type of physical disability
Facilitators	Factors that facilitate/support/help you in your learning experience as a physically disabled student at the university.
Barriers	Factors that challenge/hinder you in your learning experience as a university SwD.
Prompts	*Physical:* University campus/Classrooms/Laboratories/transportation.
	Social: Family/Colleagues/Academic and Administration Staff.
	Attitudinal: Flexibility of the program and assessment procedures/Access to information/Availability of devices and services for learning.

Table 2
Showing the initial codes, subthemes, and final themes of the facilitators for higher learning of SwD.

Initial Code	Subtheme	Final theme
• Accessible Elevators • Accessible Toilets • Properly accommodated campus structure • Accessible Classrooms	• Proper Infrastructure	Facilitators of learning for female SwD
• Family Support • Academic Staff Support • Admin Staff Support • Colleagues' Support	• Positive Social Support	
• Metro with Accessibility System • Establishment of Student Support System • Accessible Blackboard • University's Website and Banner Digital Library • Students' Email	• Accessible Transportation System • Availability of Student with Disability Support Center • Accessible Electronic Services	

Table 3
Showing the initial codes, subthemes, and final themes of the barriers in learning of SwD.

Initial Code	Subtheme	Final theme
• Inaccessible Classroom chairs and tables • Improper air conditioning • Heavy classroom doors	• Improper Internal Design of classrooms	Barriers of learning for female SwD
• Narrow corridors • Slippery toilet floors • Preoccupied toilets by non-disabled students	• Improper construction of restroom area and services provided	
• The door is difficult to be pushed or pulled • No information of services	• Heavy College Entrance Doors • Lack of Orientation to SwD about the Services provided to them.	
• Inappropriate attitude • Underestimation	• Lack of Academic Support	
• High bench • Uncomfortable stools • Unsafe floor power socket	• Improper Internal Design of Laboratories	
• Improper cafeteria furniture • Lack of special queue for SwD in cafeteria • Inaccessible vending machine	• Limited Non-academic services	
• Elevators or escalators not working	• Malfunctioning of Elevators and escalators	
• Uneven floors of the outside areas of the university campus	• External structures of campus	

Table 4
Shows the percentage of distribution of admissions of SwD.

College	participants
APPLIED COLLEGE	15%
COLLEGE OF ARTS	15%
COLLEGE OF BUSINESS ADMINISTRATION	15%
COLLEGE OF ARTS AND DESIGN	10%
COLLEGE OF COMPUTER AND INFORMATION SCIENCE	10%
DEANSHIP OF COMMUNITY SERVICE AND CONTINUING EDUCATION	10%
COLLEGE OF EDUCATION	5%
COLLEGE OF MEDICINE	5%
COLLEGE OF SOCIAL WORK	5%
DEANSHIP OF PREPARATORY YEAR OF HEALTH SCIENCES	5%
COLLEGE OF SCIENCE	5%

Accessible toilets. On being questioned about the toilet facilities, 60% of the SwD agreed on the accessibility and availability of toilet equipment for students with special needs. P01 described the toilet facilities for SwD in following words, *"The wide space of the toilets allows me to enter with the wheelchair; it also has several enabling features such as the handrails near the toilet seat, low height placement of door handles, and the lightweight material used for toilet doors."* Another participant (P04) added about the other equipment provided in these toilets, *"An additional advantage is the provision of a sink with mirror near the toilet seat".*

Properly accommodated campus structure. The university campus includes stations, gates, lobbies, corridors, and outdoor courtyards. The students reported that from their experience the university in general is designed to be suitable place for wheelchair users. This conclusion can be deduced from the responses of many SwD, for example, P20 stated, *"There is a wide space at the station to*
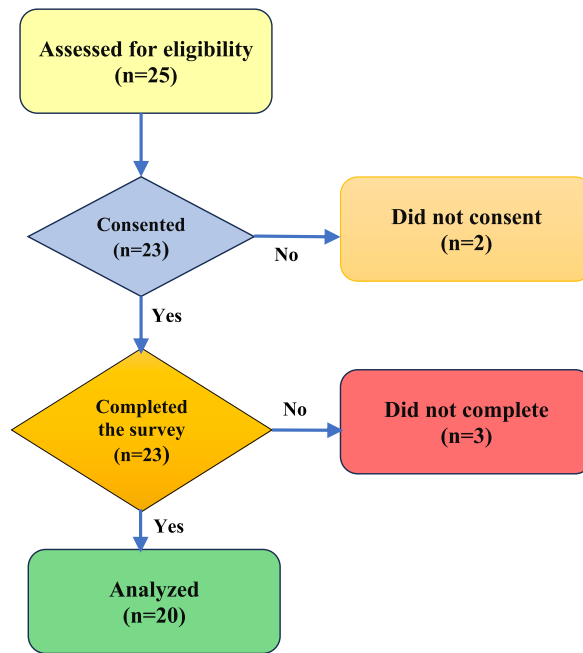
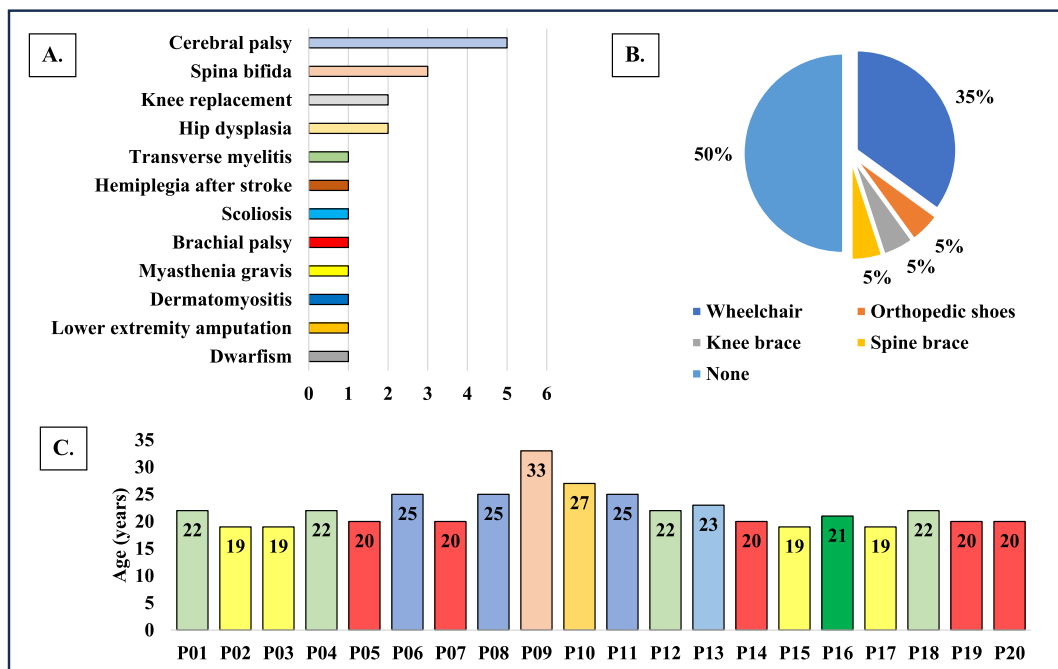**Fig. 1.** Shows the inclusion of participants in the study.

Fig. 2. 2A shows the distribution of various disorders; 2B shows the percentage use of assistive devices; 2C shows the age variation among the SwD. Where P01 to P20 stand for twenty participant's IDs.

enter with my wheelchair". The spaces inside the buildings and outside are wide and ramps are provided almost everywhere, as understood from the response of P04, *"The ramps instead of stairs are helpful. I believe that our university is prepared to enroll students with health problems."*

Accessible classrooms. The respondents appreciated the spaciousness and accessibility of the classrooms, and they agreed that light weight tables that are not attached to the seats aids them in comfortable seating. Additionally, some students claimed that some colleges offer classrooms with two entrances, allowing them to enter from the door closest to them, reducing crowding and the time

and distance needed to get there. These deductions are taken from the like responses of P10, *"It's wide in space, and the movable table gives enough space for the disabled person …. There are also two doors for the classroom so, I can enter from the door that is the nearest to me."* And from P05, *"The chairs are light, and the tables can be pulled easily.".*

3.4. Positive social support

The interviewees were questioned regarding the social support their families, professors, administrative staff, and coworkers gave them to help them learn at the university. Positive family and academic staff support was the most frequently mentioned facilitator (95%).

Family support. The family provided excellent financial support in the form of a private car and the supplies required for school, among other things. As mentioned by P11, *"I mean they are very supportive … they provided me with a private car."* And P04, *"They support me with everything I need, even if I need certain tools or materials, they provide it for me."* Additionally, the positive family support also included the psychological aspect. One student (P10) assured that she had her free will to decide what to do, *"My first supporters were my family … even if they think that some things are difficult for me, they will say okay go and try if you see it is difficult you decide, the choice is yours to make."* and another student (P16) reported her parents being affirmative of completing her higher education, *"No, thank God they are supportive … I mean they didn't say to complete or to drop out, instead they insisted on continuing my education because at first, I didn't want to."*

Academic staff support. The support provided by the academic staff included being "lenient" or flexible in taking attendance to classes or exams. Regarding the class attendance, one student (P06) mentioned that she takes dialysis sessions and said, *"There are two groups, online and onsite, sometimes I feel tired after dialysis, so I tell the instructor that I want to be with the online group, and she say yes."* Moreover, another participant (P07) reported that during the COVID-19 pandemic, the instructor recommended that she not attend the exam for her safety, *"Yes they are so kind, I mean one of the teachers when she knew that I'm ill during Covid-19 pandemic she told me "No, do not attend and I will conduct an online exam for you"* even though the college is so strict … 'you are like one of my own daughters."*

Provision of tools needed to support the student's learning experience was an additional sort of academic support as reported by a student (P09), *"The professors cooperate with me, they prepare all the things I need during the exam."* Few participants (like P09) also confirmed of the motivational reinforcement from academic staff, *"They always keep in touch with me and ask me about what I need. I feel very motivated, and I come into college without any fear because they are all around me."*

Administration staff support. Participants reported that their interaction with the administrative staff is not as much as with academic staff; however, they get their help and support when needed. Half of the participants (50%) showed a positive response towards the attitude of administrative staff. The deductions are based on the dialects of the participants such as, *"A simple service that was offered to me is golf-car, now there's no need to worry when I'm late."* (P08). Few students, P01 and P06, described about the help she was provided for her assistive device in her statement, *"Security staff helps me in charging my wheelchair battery while I'm in class till the end of the day.",* and *"When my wheelchair battery suddenly went off, the Security staff came to offer help and to carry me.",* respectively.

Peers' support. Positive support and academic assistance provided by the students' colleagues was the second most reported facilitator (90%). Few SwD reported that their classmates assist them with classwork and projects if they need support with that. For instance, one student (P14) had a learning disability in addition to the physical disability and mentioned, *" I have a learning disability, and I have a group of friends who help me to study and complete my projects."* Furthermore, the student's colleagues showed positive behavior and empathy and provided support without hesitation, *"They carry me, sometimes I'm tired when I come to college, so they try to be by my side or close to me, just in case anything happens."* (P07). Another SwD (P02) described about her colleagues' assistance saying, *"There is this group of people who come and offer help, if you refuse, they sit close by and observe what you will do. If you need any help, they ask you first."* Moreover, P13 added about her colleagues stating that, *"They open the door for me, they fix my table".*

3.5. Accessible transportation system

All the participants of this study were enrolled in the Princess Nourah Bint Abdulrahman University, Riyadh, which is the largest women's university in the world spread over 8 km^2 in size. Considering that the university is a large institution, the metro is one of the fastest ways of transportation in the university as reported by 80% of the students who perceived it to be a facilitator, for instance, P09 stated that, *"It's the biggest blessing in this big university, how else would I walk without it."* The metro van has multiple features to make the SwD feel safe, e.g., specified places for the wheelchair users to sit while the metro is moving, *"Honestly, it has no downsides, it's well prepared from A to Z, there are no obstacles in the entrance, and there is a special place for the wheelchair. It was a pleasant experience thank God.",* said another participant (P02). Additionally, it has a button placed at the entrance gate of the metro carriage which increases the time to keep the gate open, which can be confirmed by the statement of P01, *"If you notice, there is a great feature for the persons with special needs, a button that when pressed can keep the metro doors open for 5 min".*

3.6. Availability of disability support center

The university offers diverse supportive approaches for SwD, such as disability support center which offers multiple services to enhance the learning experience of these special students. The center is responsible for evaluating and assessing the students' condition, and planning the support and services required to enhance their learning experience at the university. The services provided at this center include academic, financial, and psychological support.

Most of the participants of our study agreed to the immense support they received as confirmed by P01, *"Once a student with a*

disability is enrolled in the university, she is contacted by the support *center for students with disabilities to understand her condition and provide services depending on the student's needs."* Further, participant P16 emphasized the proactiveness of the Disability Support Center by stating that, *"The* support *center sends questionnaires to explore our needs on a regular basis."*, and P06 asserted about the financial support she received, *"They provide me with* financial support *based on my condition in addition to the student's stipend."*

The SwD are assigned a special advisor who guides them through their academic stint at the university, said P11, *"there is a special advisor for each student. I would go back to her if I felt that I was lost, especially that I was unable to make friends and so on. …. , so, I would go back to her, and she would direct me."*

Moreover, the center provided SwD with special cards to receive special care and priority, as stated by P08, *"I have the blue card that I received from the support center which includes services such as the provision of golf cars when needed; they allow the buses to park at the station that is close to my college ……".* Another student P11 confirmed that, *"They once gave us a card to cut short the line at the cafeteria. We have a priority."*

SwD explained that they received leverage in time given for completing the assignments, as said by P01, *"If I couldn't submit at the specified time they extended the submission time for me, and when I couldn't show up at the final presentation of the project, they allowed me to be evaluated by the committee of the other section.".*

Few students like P07 and P13 appreciated the favors received during exams and said, *"They made my exams online.",* and *"Since I only use one hand, they give me some extra time and a comfortable table during the exam"* respectively.

The support center also rearranged the lecture rooms for the physically disabled students to the ground floor to make it more accessible to them, as said by P17, *"When I say that 'I can't go up to the second floor, they changed the class to the ground floor, they make everything easy for me."* Student P19 also highlighted the special treatment she received after her corrective back surgery which limited her movements and required a special chair, *"The Support Center had raised a request that I couldn't take the exam with regular chairs … they provided the chair for me."*

Other support center services are organizational adaptations that assist SwD to find techniques and strategies that can help them in their academic achievements, as confirmed by P17 in her statement, *"When I failed in English class, they provided me with a private teacher who teaches me once a week for free."*

3.7. Accessible electronic services

Students were also interviewed about the electronic services which included blackboard, university's website and banner, digital library, and students' email. The majority of the participants (80%) reported that the electronic services are easily accessible, and it further enhanced the current educational system to be more inclusive of SwD as confirmed by P01, *"Everything is easy to reach, and everything is clear even if there are any problems the* support *is responsive to you, their response is fast."*

3.8. Barriers in higher learning by female SwD

The interview included questions from nine sub-themes of barriers to learning as mentioned in Table 2.

3.9. Improper internal design of classrooms

Inaccessible classroom chairs and tables. The internal design of classrooms constitutes the most frequently reported barrier that almost all participants struggled with (90%). Participants mentioned multiple difficulties in using the wheelchair in the classroom, one student (P11) reported about the table armchairs and their design, saying, *"Some of the lectures are 3 h long, so these chairs (referring to table armchairs) are very uncomfortable … when I am holding stuff and trying to stand up my knees hit the table".* While the other participants reported about the long tables and separate chairs, which constituted a barrier for wheelchair users because of their height and length. One of them (P01) said, *"The wheelchair doesn't slide under the table at all, as you can see I am tilting my wheelchair just to get closer to the table.",* and the other (P20) complained that *"Sometimes my wheelchair is on a higher level than the classroom's table which makes me uncomfortable … also sometimes the classroom tables are placed really close to each other and I can't move around them, so I am forced to sit in my wheelchair without using a table."*

Improper air conditioning. One of the participants (P09) was unhappy about the classroom's air conditioning system and blamed it for her poor performance during the exam as, *"I once was hospitalized due to the low-temperature degrees of the central air conditioning in the classroom. When it's cold, my joints get stiff, and I can't feel them! On that day, I handed out my exam paper before answering all the questions. I couldn't hold the pen anymore; it was freezing to death."*

Heavy classroom doors. Heavy classroom doors are a trouble for the physically disables students as they need assistance in opening these doors. SwD P06 stated that, *"I always need someone to open the classroom's door for me, as someone who can only use one hand, it's extremely heavy".* The barrier was further confirmed by P01, *"Also the classroom doors are extremely heavy, if it closes while you're still inside the class you will be stuck inside.",* and P08, *"I am holding two crutches, what am I supposed to do to open the classroom door? Push it with my elbow? I can't! It's too heavy!"*

3.10. Improper construction of restroom area and services provided

Narrow and long corridors for the restrooms. Some of the participants like P01 criticized the restroom construction for SwD saying *"The toilet corridor is long and narrow, so it doesn't allow me to turn my wheelchair to change its direction, sometimes I even hit the wall",*

while the other (P20) added that *"It is uncomfortable for us, so sometimes I don't use the toilet at the university … In some colleges, it is narrow, and the corridor for the toilet is narrow too."*

Wet and slippery toilet floors constitute. The students using crutches, knee braces or orthopedic shoes can face problems in walking on wet floors as it may cause falls. 65% of the SwD confirmed the situation and P08 stated *"The ground gets wet, and you basically slip and fall …. I fall if I use these crutches … I slip by the water."*

Preoccupied toilets by non-disabled students. Occupancy of restrooms assigned for SwD by non-disabled students delays their work as confirmed by P16, *"Other non-disabled students use the toilet for people with special needs, so the time passes while they are in, and whoever needs it cannot enter."*

3.11. Heavy college entrance doors

An equally significant point to consider is the college entrance doors. Proper door designs and regular maintenance are important to ease the entrance of all students, especially the disabled ones. Only 10% of the participants complained about the college entrance doors to be a barrier for them, as stated by P20, *"Sometimes the college doors are small for my wheelchair … also sometimes the doors are out of service and don't open automatically so someone has to open them for me, or I have to open them by myself … it's so heavy."* P02 confirmed that *"When the door doesn't open automatically … you need some power and control to open it because if you're not strong enough while opening them, your wheelchair may flip over."*

3.12. Lack of orientation to SwD about the services provided to them

One of the barriers that have been identified in this study is the unawareness of the participants to multiple services provided to SwD that exists in the university. It was confirmed by P07, *"I wish that the academic center had more employees, because for sure there are more people who have the same condition as mine, but they do not know about the center and its services, if my English teacher hadn't told me about it, I wouldn't have known either."*

Some of the participants of this study confirmed that they were unaware of the accessibility of metro to SwD, as said by P13, *"I never went to another station because I never used the metro, I don't know if it is suitable for wheelchairs, or if there is a specific place that stabilizes the wheelchair."* Participants also reported some of the challenges they face because of reduced knowledge of the staff and other students of the different types of disabilities and their consequences. As mentioned by P10, *"Honestly, there is a lot of ambiguity regarding my condition … People do not have proper knowledge regarding the invisible disabilities, I mean they do focus on the visible disabilities that everybody notices, but there are other disabilities like mine that you can't see … Teachers act suspicious, they say 'so you have myasthenia gravies but how come I see you on some days jumping all over the place and on the other days you say that I feel sick and I cannot attend the class?'"*

3.13. Lack of academic support

Inappropriate attitude. Academic staff are one of the most vital and influential elements in the journey of every university student. Their importance is raised for SwD due to their special needs and care. Unfortunately, almost half of the students reported academic staff to be somehow a barrier (45%), because of their strict attitude and lack of knowledge about student's health conditions, which had a negative impact on some SwD grades and feelings. As reported by P08, *"Sometimes the lecturer is unaware of my condition and asks in the class and in front of all the other students about my condition which really makes me embarrassed and uncomfortable."* The other participant P07 complained that *"Not all of them but some lecturers are merciless, they treat you as if you are nothing but a wall! They don't care if you come sick to death or if you're being hospitalized for a month! I am tired of repeatedly being forced to tell them every semester about my condition."*

Underestimation. Furthermore, some interviewees felt some underestimation regarding their abilities by the lecturers, as deduced from the statement of P11, *"You can say that I experienced underestimation and bullying."*

3.14. Improper internal design of laboratories

Considering that not all majors use the laboratory settings, only nine participants affirmed using them, of which some have addressed the difficulties they have faced while taking a lecture at the laboratory. The barriers reported by participants at the laboratories included high benches, uncomfortable stools, and unsafe floor power sockets.

High bench. As stated by P01, *"Um look, it differs from one case to the other but I am not tall enough so I couldn't use some of the lab equipment, it is very high … I wish there was a lower table."* Another participant, P08, confirmed the situation, *"It is mandatory to remove all chairs at the lab, especially at the chemistry lab where we work while standing. The problem is working from standing using one hand and holding the crutch with the other. The lab bench level is higher than the chair levels."*

Uncomfortable stools. Some participants faced problem in conducting experiments as mentioned by P19, *"I can't bend my back to use the microscope, the level of the bench that has the microscope is high I wish it was lower … the stool chairs are really bad … it doesn't have back support, so my back gets tight the whole lecture."*

Unsafe floor power socket. Other participants explained the problem related to the placement of power socket on the floor in her statement (P18), *"There is this opening on the floor to plug in the chargers (floor power socket), sometimes it's open or has some wires connected to it and I don't notice it … sometimes I stumble upon them."*

3.15. Limited non-academic services

Improper cafeteria furniture. A participant (P01) who is a wheelchair user highlighted that the cafeteria is not a convenient place for the SwD as the tables of the cafeteria are not fit for wheelchairs, *"The level of cafeteria's tables is unsuitable with my wheelchair level."*

Lack of special queue for SwD in cafeteria. Some of the interviewees were dissatisfied with the services at the cafeteria, as there is no designated counter or queue for SwD. The cafeteria's furniture was also not designed to accommodate the needs of SwD. One of the interviewees (P01) explained her struggle while in the cafeteria, *"The queue in the cafeteria is crowded and is very hard to enter with the wheelchair, there is no special line.",* other participant (P04) confirmed her situation, *"There is no special card for SwD that allow her to pass the queue, and there is also no specific queue for the disabled students."*

Inaccessible vending machines. There are multiple vending machines at the university that serve university members. However, some of them were not designed to accommodate the needs of SwD. *"The payment option is placed very high and hard to reach, also in order to take the product you have to push a metal plate, and this is hard for me"* confirmed P13.

3.16. Malfunctioning of elevators and escalators

Some services provided by the university that are designed to facilitate the movement of students and staff around the campus, once disrupted become a challenge and affect students experience at the university. One of these services that pose a challenge, as reported by more than half of the participants (60%), is related to the elevator and escalators malfunctioning. In her statement P06 confirmed that, *"Elevators are always out of service at this university, always, always, always, this is difficult for the disabled person, this is stressful for the disabled person."* Another student (P07) added, *"There are few elevators at the station. So, sometimes if one of them becomes out of service, I am stuck, I can't climb the escalator, I'm afraid of falling, and then no one will help me, so I go up the stairs and I'm panting."*

External structures of campus. Participants have been asked regarding their thoughts on the stations leading to their colleges, and more than half of the participants (55%) agreed on finding some difficulties with the floor of outside areas of the campus being either uneven, or improperly designed which might lead to students being late to class or injured. As stated by P14, *"The ground floor or the university entrance as you step down from the car … it is not smooth, it is like a hard stone that can make someone fall … it is not even."*

4. Discussion

SwD in higher education reported feeling disempowered, marginalized, and unpublicized. They frequently hide their medical condition/s because they feel unaccepted because of the level of support they need [8]. Therefore, social support in higher education is crucial and can be described as the act of service, attention, and consideration extended by another person or group of people [37]. Participants in this study perceived social connection as a facilitator, which is consistent with previous findings [11,37,38]. This type of support was provided by both family and non-family members and was perceived to be a significant factor that can influence their self-appreciation and help them succeed in their educational journey [38].

Academic and non-academic services are offered by the support center for disabled students with impairments to help them during their university years. Previous studies have established that continued support encourages educational equity and enables students to reach their potential despite any obstacles or hurdles they may encounter. It has also been reported that improved access and support services are necessary to guarantee that all university students participate equally in social and academic life. According to Couzens et al., 2015, this kind of support can be accomplished by conducting a thorough evaluation of student's specific requirements [39]. In this study most of the participants pointed out that the student support center has played a significant supporting role which contributed a great deal in student's participation in different social activities held at the university. "This is consistent with the findings of a study by Mbuvha's (2019), which reported that students with a range of disabilities generally agreed that receiving academic support from the Disability Assistance Unit has indeed improved their academic performance [40]. Consequently, the study's participants have viewed the support center as a facilitator rather than a barrier.

The specific responsibility for aiding students with disabilities rests with each member of the academic staff. Thus, understanding educators' attitudes and viewpoints regarding students with disabilities is crucial [9–11]. Additionally, academic staff are frequently students' first point of contact, particularly during their first year of study. The results of this study demonstrate that academic staff members are supportive of students with PD, when it comes to attendance in classes and during examination' periods. This kind of support include but not limited to granting extra time as and when needed, assigning specific rooms to them, and extending deadlines for project submission. Similar results have been reported by other investigators [41]. This study also showed that SwD value the academic support offered by the Disability Support Center, and they felt that such support has undoubtedly assisted in improving their academic performance. These results are consistent with a previous report, which indicated that receiving academic support may well increase the likelihood of improved performance [42]. Additionally, in this study SwD have also appreciated the convenience of having online access to their study plans, grades and the availability of the courses' materials online. The outcomes of this study are in line with the previous report of Philips et al. which suggested that lecturers also adjusted the online programs in response to the demands of the students which helped them perform better in academics [43].

According to the participant of this study, appropriate elevators should be available in all university's buildings due to the vast size of the academic buildings. They notably mentioned width of elevators coupled with low level buttoned as major facilitators. Another important institutional component was the availability of floor ramps which were installed at the entrances of all buildings. These were also emphasized in the previous reports [39]. Moreover, a more recent study by Sulaj and colleagues (2021) reported that SwD had access to buildings and campus areas and cited the accessibility to university campus [44]. This outcome is consistent with this study,

which concludes that universities are accessible to wheelchair users. In addition, subways were the most frequently mentioned facilitators for students with physical disabilities when it comes to transportation options. This finding is in line with the that of Sulaj et al. (2021), which found that transportation facilities considered to be an essential service that can further enhanced the accommodations provided for the students [44].

The current study discovered that one of the main obstacles that SwD have encountered in their higher education is improper internal design of classrooms and laboratories. The most common infrastructural barrier that almost all participants experienced was in the classrooms, particularly for wheelchair users who complained that the furniture was not suitable for their needs. This is consistent with the outcomes of the study conducted by Moriña and Morgado [45], that claimed that the furniture that is not designed for SwD needs forces them to operate in inappropriate settings. The height of benches caused problems for certain participants especially in the laboratories. Similar findings were in a previous study which indicated SwD were faced with trouble setting up laboratories and using the equipment [34].

The participants also identified the poor design of the toilet area as a significant hindrance. The participants reported difficulty maneuvering through the bathrooms' small hallways. This is in line with earlier research [45,46], which indicated that the SwD felt the poor design of the restrooms to be a big concern, leaving them in a position of dependence on others. Additionally, one of the study's participants brought up the important issue of non-disabled people occasionally using specially constructed restrooms. The findings of this study are supported by Vincent's study [47], which noted that SwD found the idea of having to wait a long time to use the single accessible restroom to be bothersome.

Another obstacle mentioned by the participants was the malfunction of escalators and elevators.

Participants in this study discovered that elevators made it easier for them to get from one place to another, but they usually complained about elevator malfunctions, which made it harder for them to learn because they were late for class. This result is in line with that of Muzemil (2018), who discovered that students' access to campus events was restricted by the presence of inoperable elevators [48]. Additionally, previous research revealed that some institutions, particularly the older ones, lacked elevators, which made it challenging for SwD to move between floors and had a negative impact on their academic performance [44,47].

Other reported obstacles that kept students from arriving on time for class included the size of the campus, uneven flooring, and poorly planned ramps, these outcomes are consistent with previous reports [47,49], which found that many SwD struggled to move between points within buildings, making it difficult for them to get to classes on time or even missing certain lessons.

This study also found the heavy and manual entrance doors as a barrier for the SwD. As per the statements of SwD, they find it difficult to open heavy entrance doors especially when they are using assistive devices. Similarly, another study revealed that wheelchair users couldn't unlock doors, causing the students to depend on others for assistance [50].

The inaccessible cafeteria and food machines are additional barriers identified in this investigation. Although these machines are accessible and useful, few users reported having trouble paying for the food because the payment area was elevated and not easily accessible, whilst the collection area for their perspective order/s are too low. This finding was corroborated by a study conducted on high school students by Pivik et al., 2002, which found that students thought cafeterias were inaccessible because of the tight food lanes and difficult-to-reach food locations [51]. Despite this, the literature didn't yet address all restrictions and difficulties that are experienced by SwD in cafeterias and cafes.

Lack of orientation of the services offered to SwD and about their needs was an additional barrier that had been reported by participants in this study. The academic staff appeared to undercook the special needs and the demands of the SwD which may have a significant negative impact on their learning experience and academic achievement. Other researchers postulated that this might be due to the negative attitudes of faculty members towards the students and the challenges they must overcome to be a graduate [11,12]. The study's participants also stated that the academic staff appeared to have limited understanding of the various medical disorders and the extent of their severity. As a result, this had led them to either misunderstand or misinterpret student's academic needs and requirements. For example, a lecturer asking a student about her condition in front of the class put the student in very awkward position. Such an encounter has made this student constantly explain themselves, which increased their demands for more effective reinforcement. This was in line with the findings of Fuller et al. (2004), which showed that students repeatedly told their professors what kind of disabilities they had and what accommodations they need [52]. According to Zongozzi et al. (2019), only few qualified academic staff can effectively connect with SwD. Their lack of training has led to unfavorable performances and poor treatment of SwD, which badly impacted the academic performance of SwD as well as their involvement in participation in everyday activities [4]. Furthermore, this has even led to failure in their studies [12]. This study has undoubtedly demonstrated the importance of inducting and educating all university staff (academic and administrative) as well as all students alike on all types of disabilities and their impact on the day to day living of SwD (academic and otherwise). Therefore, greater understanding of these preventable barriers will encourage and ultimately achieve equity in student participation in academic life [34].

5. Conclusion

In summary, this study has examined the barriers and facilitators experienced by female students with physical disabilities in higher education environment. As a result, some promoters have surfaced, citing the enormous assistance given by the student's family members, academic staff, and peers. The services offered by the Disability Support Center, and the effective transportation system were greatly endorsed. All these factors have contributed to promoting inclusive education and helped in equalizing the opportunities for both students with and without a disability.

Nevertheless, systemic issues have emerged which included the lack of accessibility that were particularly noticeable in the classrooms and on the university campus. It has also been pointed out that the overall knowledge of some university staff and students

of both types of disabilities and needs of those with disabilities was somewhat inadequate. This study calls for improving the learning experiences of SwD in order to provide them more opportunities for success. Thus, it is exceedingly paramount to consider all the obstacles discussed in this study.

Limitations

The time available for conducting the entire investigation was constrained because this was a graduation research project, which was the initial limitation of the current study. A second drawback is the small sample size, which can be ascribed to some students declining to participate because they were too busy with schoolwork. Furthermore, because the interviewer and participants were both university students, it was challenging to schedule appropriate times between them, which may have impacted the sample size. The fact that some of the interviews were conducted online since some participants were unable to attend is another drawback of this study. This obscured the student's disability in its entirety as well as the student's body language and facial expressions. Furthermore, because we predominantly included students with physical disabilities, the generalizability of this study's findings may be compromised because various disabilities necessitate different barriers and facilitators. Despite these drawbacks, it is determined that research on the enablers and hindrances faced by SwD has substantially furthered our awareness of their problems, which can be very helpful when planning future research. Finally, further research studies are needed before the current findings can be generalized to all other forms of disabilities amongst students in higher education. Similarly, more studies are required to investigate the various and barriers and facilitators that have not yet been identified by this study.

Recommendations

The development of inclusive education for SwD in higher education should be supported, according to the study's conclusions. This can be achieved by creating institutional policies that protect students' rights to realize their educational goals. Additionally, facilities for the SwD during their university years should be incorporated into university architecture. Additionally, frequent maintenance of the university's automatic doors, elevators, escalators, metro, and restrooms should be made mandatory to make the most use of these valuable services.

Although there is variation in the specialties of the participants in this study, there aren't many SwD enrolled in the higher education. The SwD must first be given chance and equitable treatment to attain inclusive education. This can be accomplished by actively involving SwD in the formulation of policies and procedures pertaining to them, which will also improve their overall learning experience and give them a stronger sense of independence and confidence [53]. Physical disability should not limit the kind of work that students can complete; it must be considered that their education can include practical applications. Virtual classrooms, simulated technologies, recording the lectures and providing real-time transcription can facilitate the learning process for SwD. Duerstock et al. (2014) have presented a variety of methods for leveraging technology to bridge the gap and create a field-based learning experience [53].

Another important factor to consider is the training required for both students and faculty members on the facilities the university provides for SwD. This can be achieved by conducting frequent seminars for academic staff, administrative staff, and students on topics related to SwD. In conclusion, understanding problems, obstacles as well as the needs of SwD will contribute effectively to finding and implementing long-term, equitable and measurable outcomes.

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Data availability statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

CRediT authorship contribution statement

Hanan M. AlTaleb: Writing – original draft, Investigation, Formal analysis. **Dalal A. Alsaleh:** Investigation, Formal analysis, Data curation. **Anwar S. Alshammari:** Writing – original draft, Data curation. **Shatha M. Alsomairy:** Investigation, Formal analysis, Data curation. **Shahad M. Alsuaqir:** Methodology, Investigation. **Lama A. Alsaleem:** Validation, Investigation, Data curation. **Asma B. Omer:** Writing – review & editing, Methodology. **Ruqaiyah Khan:** Writing – review & editing, Visualization, Validation, Formal analysis, Data curation. **Reem M. Alwhaibi:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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