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Towards exploring midwifery students' misconceptions of reproductive health education: Case of Sexually transmitted infections

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Abstract. "Sexually Transmitted Infections" (STI) present a taught knowledge which evoked several agitations of comprehension. Among the factors that hamper this understanding: the nature of this knowledge, the approaches adopted in the curricula, and the learners' misconceptions. Since midwives students will be actors in health promotion and prevention of transmission of STIs, they should have adequate knowledge to transmit them healthily to the population. This study is the first to our knowledge, which aims to approach the conceptual world of midwifery students in order to discover their knowledge and their misconceptions of the disease in general and STIs in particular, and this by two tools: mind maps and individual directive interview. By diagnosing these barriers to learning, we will have time to take them into account in our teaching practices. As a result, the misconceptions identified reflect to a large extent the ideas of the media and Moroccan society, whose common knowledge takes priority over scientific knowledge. These conceptions sent us back to the obstacles: cultural and belief, epistemological and didactic. The didactic implications of the history of science could lead to effective training/teaching actions.

Keywords: Barriers to learning, misconceptions, disease, STIs, students, midwives students.

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INTRODUCTION

Sexually transmitted infections remain a main global health problem, with an estimated 1 million people becoming infected every day (Rowley *et al*., 2016; World Health Organziation, 2013).

However, there are several barriers to controlling the spread of STIs, some of which are related to the social environment and others to health system failure (Nkwabong *et al*., 2018; Vieira *et al*., 2017).

Among the factors related to this system failure, is the poor performance of health professionals in general and in relation to STIs in particular (Mimiaga *et al*., 2009; Nkwabong *et al*., 2018; World Health Organziation, 2013).

In fact, health professionals in developing countries do not receive appropriate STI education (Mimiaga *et al*., 2009), nor do they have the academic and professional skills needed to impact populations positively and take a holistic approach to care and education.

In this sense, higher education institutions should provide in-depth training to their students in order to effectively address this problem, and hospitals and health-care institutions should provide appropriate training to their health-care professionals (Junqueira *et al*., 2013; Omo-Aghoja, 2014).

Quality training is therefore necessary to equip health professionals with the skills to deal with patients according to a complex approach in prevention, care, "information, education and communication" (IEC) and monitoring, as the contribution of all actors is essential to achieve this. (Cesnik & Zerbini, 2017).

Among these actors, the midwife is at the heart of the process (Pourmarzi & Sharami, 2017; World Health Organization, 1999), she is expected to contribute to the promotion of sexual and reproductive health in general (Pourmarzi & Sharami, 2017) and to the prevention of STIs in particular. (Pourmarzi & Sharami, 2017; World Health Organization, 1999).

However, how can she succeed in her missions in the face of enormous difficulties that are hampering its professionalization process? Especially since the Moroccan midwife is the result of a school, middle school and high school system with several failures. (S. Khzami *et al*., 2008; S. Khzami *et al*., 2012; S. Khzami et al., 2018 ; Quessada *et al*., 2011):

- It has received programs that adopted a linear approach (S. Khzami *et al*., 2012; S. Khzami *et al*., 2018) especially in reproductive health in general and STIs in particular.
- The student curriculum prevented the development of critical and reflective thinking and therefore could not contribute to equipping her with knowledge, skills and attitudes.

In addition, several studies have found that students (Mattebo *et al*., 2015; Boujemaa *et al*., 2010) have misconceptions about STIs, as teachers have (Anastácio, Carvalho & Clément, 2008; S.E. Khzami et al, 2008; Selmaoui et al., 2010) in the same subject in various countries (Anastácio, Carvalho & Clément, 2008; S.E. Khzami *et al*., 2008) such as France, Lebanon, Tunisia....

Several researchers have also diagnosed false knowledge, negative attitudes and alternative misconceptions of STIs among patients (Vieira *et al*., 2017), students and even health professionals (Nkwabong et al.., 2018; Okike *et al*., 2011; Pourmarzi & Sharami, 2017; Ranathunga, Somawardhana & Azraan, 2013) including midwives. (Phrasisombath *et al.,* 2012; Pourmarzi & Sharami, 2017; Salyer *et al*., 2008).

These indicators lead us to make a worrisome assessment on the future of the Moroccan midwife and lead us to ask the following question:

- Is the Moroccan midwife adequately skilled to contribute to the prevention and reduction of the spread of STIs in our country?
- To partly answer this question we will try to discover the knowledge and misconceptions of midwives students regarding STIs.
- As misconceptions determine: how to receive/understand a discourse and the construction of knowledge and by being part of a teaching and training approach based on the socio-constructivist model;
- We have chosen as our research objective:

To approach the conceptual world of midwives students in relation to misconceptions related to illnesses and "STIs".

Research Objectives

1. To diagnose midwives students' misconceptions of "STIs".
2. To suggest the obstacles that would be behind these misconceptions.

Research Questions

- Do midwives students have other misconceptions that comprise obstacles to their learning about STIs?
- What could be the obstacles behind it?

Research Hypothesis

Midwives Students have other misconceptions of the knowledge taught about diseases, "STIs", which could comprise obstacles to learning this knowledge in the short term and to practicing education later on.

THEORETICAL FRAMEWORK

What is a Conception?

The concept of "misconception" is a central notion in science didactics. With the emergence of constructivism, science educators have become interested in the "common sense reasoning" of learners and have adopted several conceptions to define it, namely: "spontaneous representations", "initial representations", "naïve conceptions", "other conceptions", "misconceptions", etc. (Clément, 2010).

Their aims were not to judge these misconceptions, but to try to analyze and understand them in order to make science teaching more effective, efficient, useful and civic-minded (Clément, 2010).

Moscovici (2015) and Jodelet (2018) initially defined social representations as social mental productions that oppose scientific knowledge.

Giordan and De vecchi (1987) transposed "representations" to didactics and used the concept of "misconception" which defined it as "a set of coordinated ideas and coherent, explanatory images used by learners to reason in problem situations".

Misconceptions exist as personal models in the learner's mind above all teaching and actively participate in the construction of his or her own knowledge (Giordan & de Vecchi, 1987).

They enable the perception and understanding of the formative discourse and the meaning of learning is developed following a certain conceptualization.

They correspond to "an underlying structure, an organized explanatory model, usually simple and logical, personal or of social origin that is related to a structure of thought and a level of evolution" (Giordan & de Vecchi, 1987).

For Giordan, misconceptions are translations of reality, they are uncluttered images whose terms are not univocally defined (Giordan & Martinand, 1988).

According to Clément (2010), "misconceptions, even if they are pictorial, are logical constructions inferred from individual observations, experiences and interpretations".

For Astolfi and Develay (2016), misconceptions present the learner with "the already there".

Jodelet (1984) substitutes the misconception by the representation, for him "these representations have a status of functional explanation for the pupil. They function, for him, as one mode of knowledge among others".

As for Astolfi, the misconceptions correspond to a coherent system of interpretation of scientific phenomena that he has built up over a long period. They are the result of a set of interactions between the knowing subject and his environment, and they determine the way in which the selection, interpretation and integration of "reality" will take place (Drouin-Hans, 2009).

All of these conceptions constitute a grid for analysing the "real", an explanatory model, a filter through which the subject tries to understand the "real" and act upon it.

It is a mental configuration, which he implements when confronted with a given problematic situation (Drouin-Hans, 2009).

However, these misconceptions are difficult for a teacher to resolve: they are known to be invasive, stable and resistant to change (Drouin-Hans, 2009; Osborne & Cosgrove, 1983). Because on the one hand, traditional teaching does not target them and on the other hand, they often form a functional explanatory system to which the student refers and uses as a tool to facilitate the assimilation of the knowledge to be taught (Osborne & Cosgrove, 1983).

However, if the teacher does not consider these misconceptions, they tend to resist the construction of new knowledge by learners (Drouin-Hans, 2009) and constitute an obstacle to their learning.

Misconceptions and Obstacles

What is an Obstacle?

Bachelard introduced the notion of “epistemological” obstacle as early as 1938.

For him, learners construct their own vision of the world and the natural phenomena they encounter even before any formal scientific learning has taken place: this is empirical knowledge that has already been built up (Bachelard, 1934).

He thus defines the obstacle as a set of causes of inertia and stagnation and even regression of scientific knowledge.

Didactics has included this notion in order to say that scientific knowledge never starts from scratch, but it comes up against pre-existing knowledge with which it is necessarily in rupture and discontinuity (Clément, 2010).

Bachelard argued, "It is not a question of acquiring an experimental culture, but rather of changing the experimental culture, of reversing the obstacles already heaped up by daily life" (Bachelard, 1934).

For the Aster team, the obstacles are the "hard cores" (Orange & Ravachol, 2013) of the misconceptions, indeed several misconceptions can have one and the same obstacle, just as several obstacles can explain one conception, which allows us to suppose that the obstacles would not all have the same origin; so what are the origins of the obstacles?

The Origins of the Barriers

According to some researchers, there are five main origins of barriers:

Epistemological obstacle (Bachelard, 1934) (Bachelard's theory): whose existence is often proven in the historical evolution of the construction of scientific knowledge (learners' misconceptions may present certain similarities with certain obstacles encountered by scientists, in the history of the development of the misconception itself)

Didactic obstacle (Brousseau, 1998) (Brousseau's theory): which is due to the interference of prior learning that helps in the construction of misconceptions and is influenced by the teacher or by documents such as textbooks or school posters; this obstacle is generated by the teaching process (didactic transposition, pedagogical choices made by teachers, the way in which academic knowledge is delivered). Pedagogical tools can also generate obstacles (maps, textbooks, etc.).

Ontogenic obstacle (Clément, 2010) (Piaget's theory): due to the stages of children's intellectual development. For Piaget, the obstacle is the result of psychological limitations.

Psychological obstacle (Freud, 1923) (Freud's theory): whose existence is the result of psychogenetic development (which takes into account the psychic contents, the unconscious part of the child's thought, affect and personal history).

Cultural/sociological obstacle (Moscovici, 2003) (Moscovici theory): due to knowledge conveyed by the cultural context, already scientifically treated, but still present.

After the identification of these obstacles, we want to insist on a primordial notion that the obstacle is not ignorance but positive knowledge that can play the role of a tool (Filloux, 1996), this tool could serve the midwife student to build her own learning, but it can hinder the development of this process.

MATERIALS AND METHODS

In order to approach learners' misconceptions on a given theme, the researcher or teacher must not be satisfied with a single data collection situation, but must multiply the data collection situations since a situated misconception is not only made by a situation (Figure 1) (Clément, 2010).

We will adopt this approach in the development of our interview by using redundancy and the crosschecking of several questions related to our theme in order to get as much of the conceptual world of the midwife student as possible (Figure 1).

We also administered two mind maps, one to approximate our 20 students' misconceptions of the misconception of illness and the second for the misconception of STIs.

Thus, we used the directional interview and the mind maps in order to get the maximum number of responses.

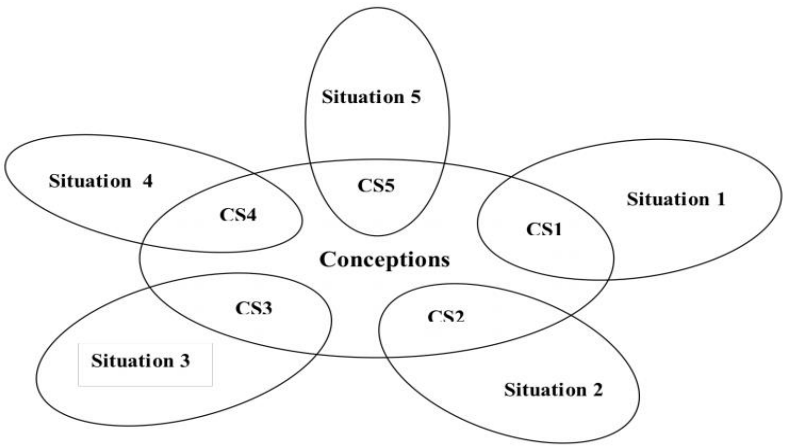


Figure 1. *Diagram of the relations between conceptions on a given theme and conceptions on the same theme (Clément, 2010).*

Justification of the Choice of Data Collection Techniques

In order to diagnose learners' misconceptions, we adopted a qualitative exploratory approach that aims for exemplarity and not generalization, by combining two tools: the individual directive interview guide and the mind map.

The interview guide consisted of 11 open, semi-open and closed-ended questions; the use of this tool in this work is dictated by the fact that it allows us to find out each respondent's opinions and misconceptions regarding the misconception of STIs.

It has been designed and developed with the objectives we have set in mind. In order to validate it, we submitted it to the critical scrutiny of specialist researchers before its final development.

To complete our data, we used the second tool, the mind map, to approach the conceptual world of the learners on misconceptions related to "the disease" and "sexually transmitted infections".

For each student, we asked the questions in French and we translated them into Arabic and dialectal Arabic to eliminate the language barrier. We also further explained each question according to each student's request.

It is important to point out that these tools were also used as a diagnostic evaluation before the teaching of the STI course.

Target Population

To reach these objectives, we chose as target population a provincial class of 20 midwives students in semester 4 at the "Higher Institute of Nursing Professions and Health Techniques" (ISPITS) of Tetouan, a choice which was well thought out since:

- Midwives students in semester 4 are halfway through their training.
- They studied STIs in middle school and high school (Bernard *et al*., 2008), so this will lead us to assess their prerequisites in order to diagnose their misconceptions of STIs (Bernard *et al*., 2008).
- By diagnosing the misconceptions of midwives students, we will have time to address these ongoing misconceptions of STIs, which we will be teaching.
- Students will also have to validate another academic year before being awarded the prize, and this will allow us to address their knowledge to achieve effective learning that would allow them to adequately appropriate STI content and to be able to transmit it healthily to the population and excel in their mission of education and prevention (Pourmarzi & Sharami, 2017).

Data Collection and Processing

Data processing was done by manual content analysis with our research team, we sorted the responses into categories and then Excel did the data entry.

Ethical Considerations

During our study, we are asked to respect the following ethical research principles:

- Respect for anonymity.
- Obtaining administrative authorization for the study.
- Obtaining student's consent for participation.
- Respect for autonomy and free participation.

RESULTS

Students' Responses Collected by the Mind Map Tool

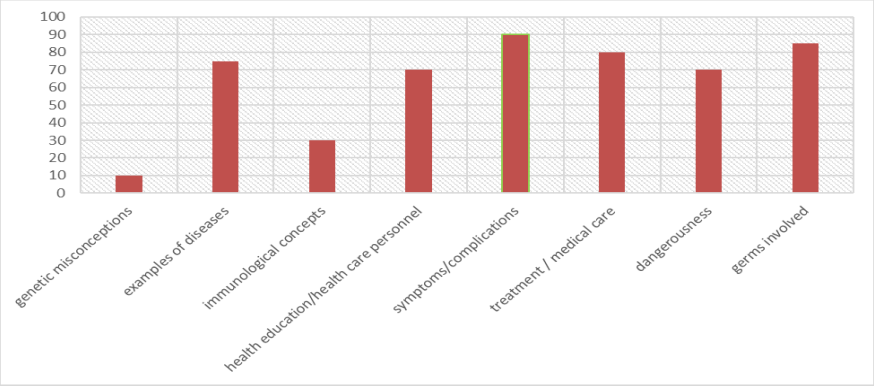


Figure 2. *Graphical categorization of students' expressions representing the misconception of "disease"*

To report the misconception of the "disease" the students used 120 expressions we grouped them into categories (genetic misconceptions, examples of diseases, immunological misconceptions, health

education/health care personnel, symptoms/complications, treatment/medical care, dangerousness, and germs involved).

The distribution of the misconception is as follows: the majority of the students18 reported the disease in the form of symptoms and/or complications. 17 reported the disease in the form of germs involved. Three-quarters of the students reported the disease as an example and 14 students reported the misconceptions of training and dangerousness. The misconceptions immunological and genetic tests recorded low percentages of responses and had as terms hereditary or non-hereditary disease, that is, heredity, immune system failure. »

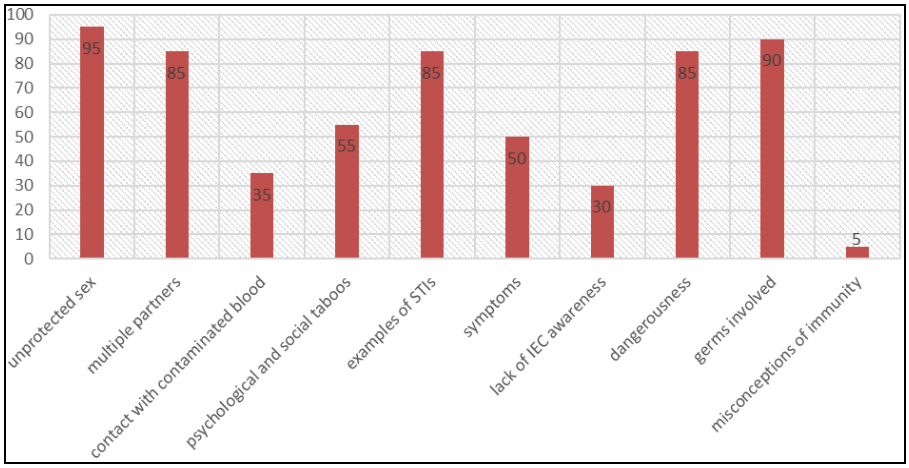
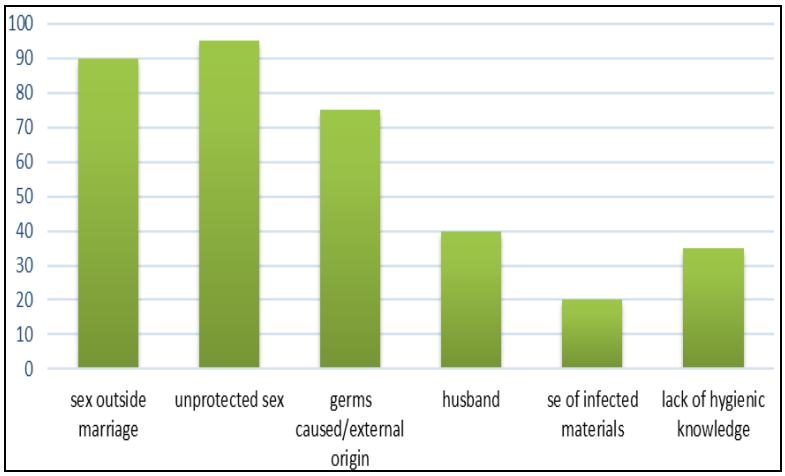


Figure 3. *Graphical categorization of the expressions used by students to represent the misconception of "STIs".*

For this question, we collected 140 responses, which we categorized as follows: unprotected sex, multiple partners, contact with contaminated blood, psychological and social taboos, examples of STIs, symptoms, lack of IEC "information, education and communication" awareness, dangerousness, germs involved, and misconceptions of immunity. Almost all students reported STIs (sexually transmitted infections) by unprotected sex, by the germs involved, by multiple partners, and by examples of STIs (especially AIDS and syphilis), so 17 respondents reported STIs by terms synonymous with dangerousness. Half of the students responded by psychological and social taboos and by symptoms of STIs.

As for the low percentages of responses, 35% of them were concerned with "contact with contaminated blood", 30% with "lack of IEC awareness", and 5% with "misconceptions of immunity".

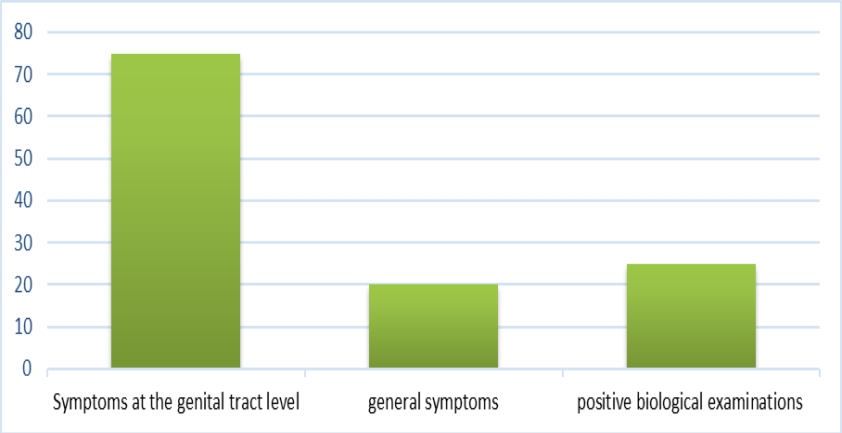
Students' Responses Collected by the Individual Interview Guide



Responses to Question 1: Graphical categorization of learners' responses on the causes of STIs.

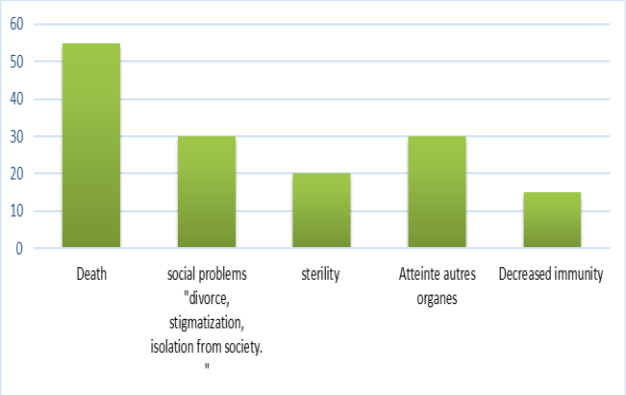
Students reported several causes of STIs: the majority connected STIs to unprotected sex, sex outside marriage, and germs caused/external origin; also for 8 students the husband was a cause of STIs.

The minority of respondents used the terms "lack of hygienic knowledge" and "use of infected materials" to represent STIs.



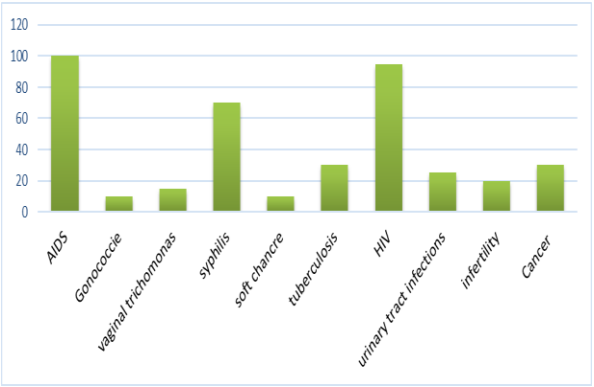
Responses to Question 2: Graphical Categorizations of Responses on STI Symptoms.

The distribution of responses on STI symptoms was as follows: three-quarters of the students reported Symptoms at the genital tract level, one quarter of the students reported the symptoms by positive biological examinations and 4 students reported the disease by general symptoms.



Responses to Question 3: Categorizations of Students' responses on STI complications.

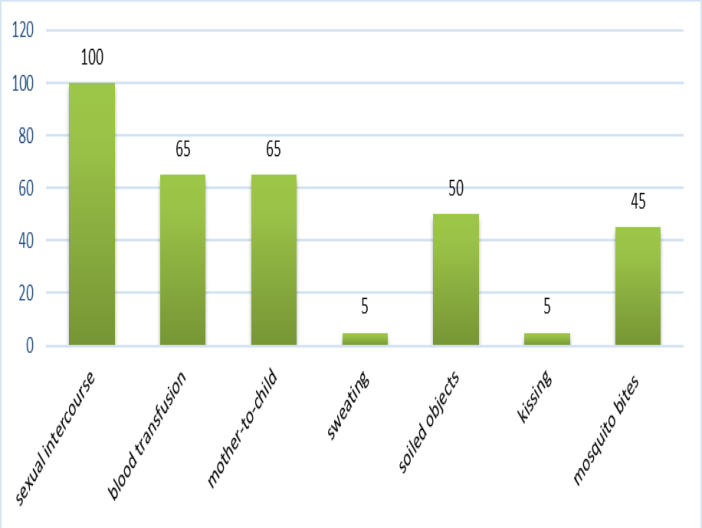
In terms of STI complications, 11 students reported death as a complication, followed by 6 respondents who mentioned social problems such as "divorce, stigmatization, isolation from society." and complications due to damage to other organs, 6 and 3 students mentioned sterility and decreased immunity as complications respectively.



Responses to Question 4: Graphical representation of responses on STIs known by students.

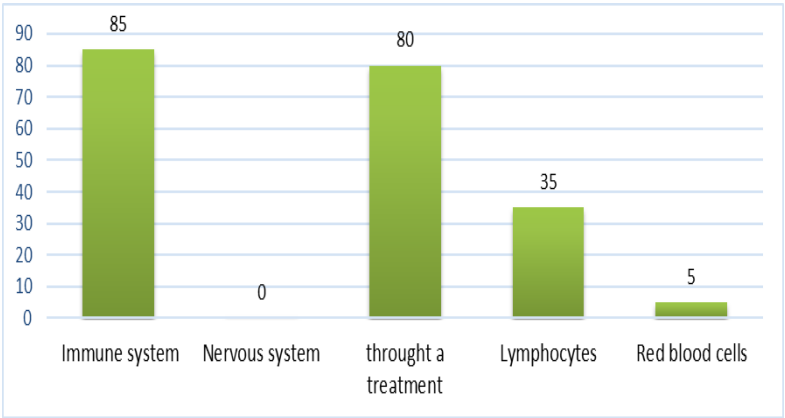
The STIs most commonly reported by students were as follows: all respondents reported AIDS, followed by HIV, with syphilis being the third most-reported STI among midwifes students.

For 6 future midwives tuberculosis was an STI and cancer was an STI, 5 responded that urinary tract infections are STIs, and 4 students reported that infertility is an STI. In a very small percentage, the STIs reported by the learners were as follows: 3 students recognized vaginal-trichomonas and only 2 recognized gonorrhea and soft chancre.



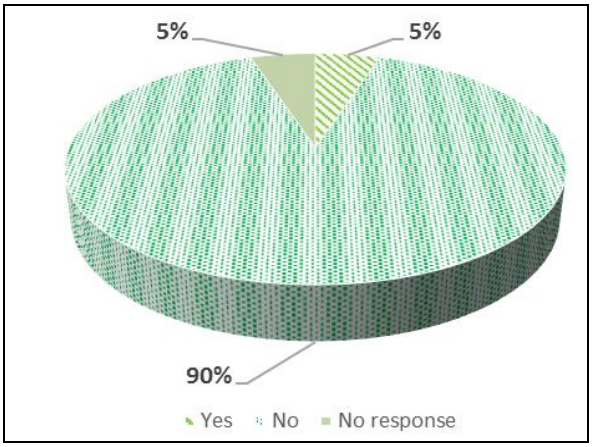
Responses to Question 5: Graphical representation of responses on STI transmission routes.

This figure shows the responses to question 8, which asked about respondents' knowledge of STI transmission ways. All students responded that STIs are transmitted through sexual intercourse, followed simultaneously by blood transfusion and mother-to-child transfusion. Transmission through the use of soiled objects and mosquito bites was reported by half of the students. Only one respondent mentioned sweating and kissing as a way of STI transmission.



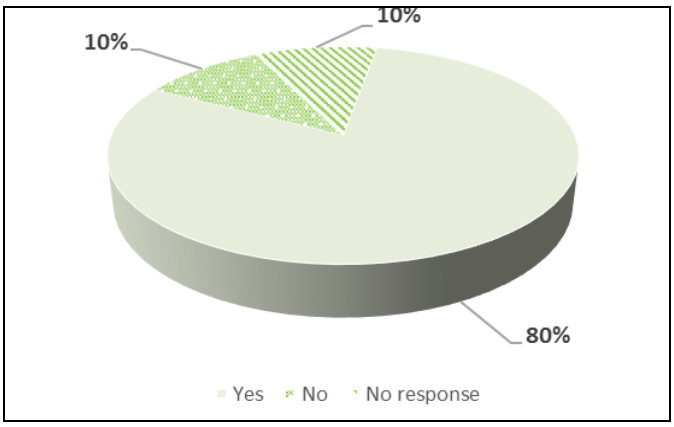
Responses to Question 6: Graphical representation of the responses on how the organization fights an STI.

More than half of the respondents agreed that the body can fight STIs through the immune system and with treatment, 7 learners mentioned lymphocytes as a means of defense, and one student checked off red blood cells.



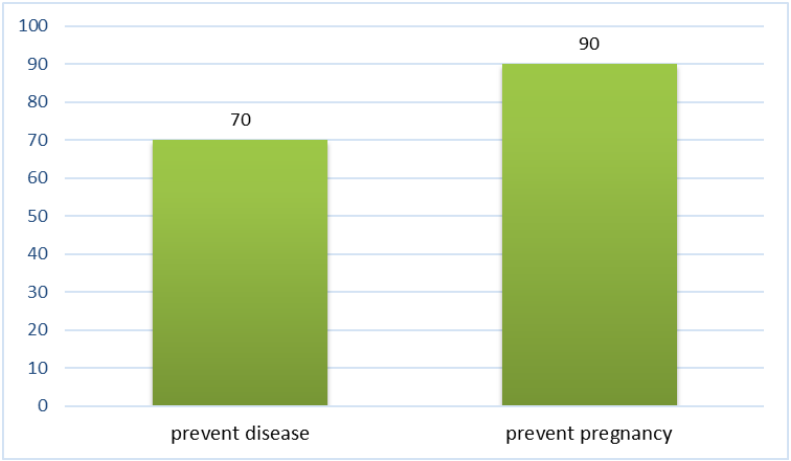
Responses to Question 7: Graphical representation of the responses on the availability of STI vaccine.

Overall, almost all of the students reported the absence of STI vaccination, as opposed to only one respondent admitting the presence of STI vaccination.



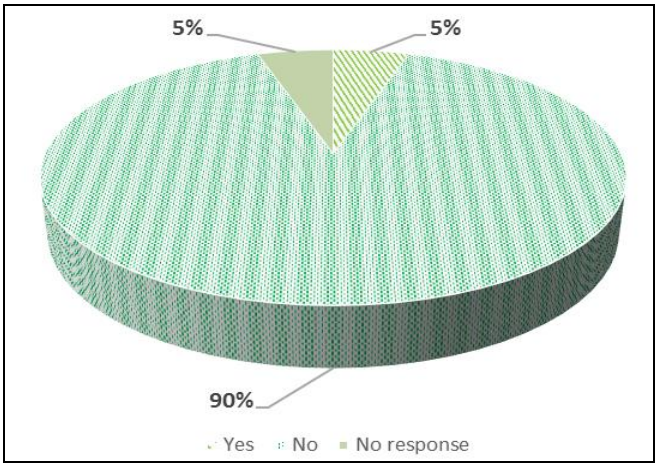
Responses to Question 8: Students' responses on the existence of people without morbid STI symptoms despite the presence of the germ in their bodies.

The majority of the MS affirmed the presence of people who do not present any morbid symptoms on STIs despite the presence of pathogen(s) in their bodies, however 2 students denied it.



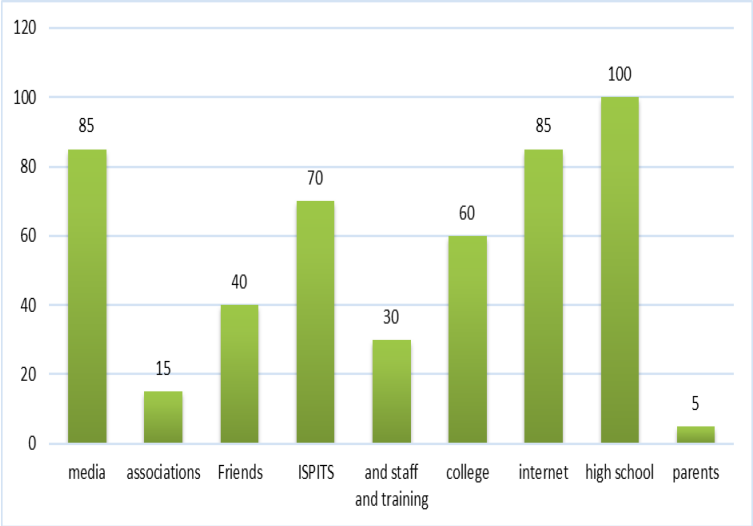
Responses to Question 9: Graphical representation of responses on the purpose of condom use during sexual intercourse.

Students' responses on the purpose of using a condom during sexual intercourse were distributed as follows: 18 learners responded that it is to prevent pregnancy and 14 reported that it is to prevent disease.



Responses to question 10: Graphical representation of the responses on the transmission of mother-foetal STIs during its passage through the genital tract.

Almost all students responded that there is a possibility that the fetus may be infected with an STI during delivery, with only one student denying this transmission.



Responses to question 11: Percentage of students' responses on sources of information on STIs (HIV, AIDS...)

Students' sources of information on HIV/AIDS are varied. All students reported that their source of information is high school, followed by the internet and the media for 17 future midwives. 14 students had "higher institute of nursing and health techniques" ISPITS as their source, followed by college for 12 students.

The sources of STI information were friends for 8 learners and staff and training for 6 students. Only one student mentioned her parents as a source of information.

DISCUSSION OF RESULTS

Through the results of the mind maps, we found that there is heterogeneity in the students' misconceptions and a similarity in the responses to the questions despite the difference in the misconceptions of "disease" and "STI".

We find that the majority of students reported disease and STIs as symptoms, suggesting that they think more about consequences than about the process.

Indeed, for them, the disease is defined by its external manifestations at the expense of a causal explanation following a scientific approach. These future midwives reflect how they themselves perceive a sick person, which refers us to the external manifestations of the disease caused by agents that also require treatment by health professionals.

This representation of disease (caused by germs, diagnosed by symptoms, examinations...and requiring treatment by health professionals...) in them, refers us to the linear or biomedical approach in health education. Most health professionals (Berger *et al*., 2014) adopt this approach and these future midwives were no exception!

This linear causality is also an obstacle to causal reasoning for learners, which follows a simplistic linearly ordered pattern where cause precedes effect. It is a way of reasoning that is familiar and satisfying to them because of its simplicity and its inclusion in everyday life.

In addition, this representation of the disease (disease →germs) that requires treatment to "cure" the body and "return it to its first state that it had before the germ entered", refers us to the microbial theory where the disease is due to a causal entity "the microbe".

This theory constituted an epistemological obstacle for researchers to evolve towards other more advanced theories (Benelhadi Elmazouni *et al.,* 2018).

Indeed, the common misconception among most midwives students refers to this epistemological obstacle since they consider the disease as a striking aggression from the outside - an unarmed, innocent and passive organism "it is a personification of the disease conceived as an evil spirit that makes a man sick" (Benelhadi Elmazouni *et al.,* 2018). This representation of students has been diagnosed in other international and national studies (Abidi, 1996; Moulin, 1991) and recently in Moroccan high school students (Benelhadi Elmazouni *et al*., 2018) and it proves the persistence of this misconception in them despite receiving university studies!

We can attribute this to a didactic obstacle, since the Moroccan academic curriculum has several shortcomings, especially in the area of STIs and immunology, a finding that has been mentioned by several studies (Aidoun *et al*., 2016; Benelhadi Elmazouni *et al*., 2018).

The minority of students in Mind Map A.1 reported the disease by immunological misconceptions such as "fighting the disease with antibodies", "defending oneself with the immune system", "attacking the immune system" and "weakening the immune system". They used these last expressions among the responses to question B.1 of the interview.

This diagnosis refers us to the warrior theory (Löwy, 2006) where immunity is conceived as a warrior activity that consists in monitoring the integrity of the body against invaders (Löwy, 2006).

In the students' responses on mind maps A.1 and A.2, there was an absence of misconception related to (complement, stimulation, differentiation processes, cognitive theory of immunity, global theory...). Despite having already studied these processes in their academic curriculum, this could be due to an oversight or to the lack of networking between these misconceptions due to a lack of understanding, thus reflecting a conceptual obstacle.

In their responses to questionA.1, the midwives students had not mentioned misconceptions related to (homeostasis, regulation, saprophytic flora, stimulation, affinity, epigenetics, bio-psycho-social approach...). Even though they have already studied these concepts/phenomena. This could be due to an oversight or that they have not formed networks between these misconceptions and "disease, STI" and this requires a direct question to get them mobilized.

As for the responses to question A.2, most of the students reported the misconception of "STI" by modes of transmission, symptoms, examples of STIs, and by synonyms of the word danger such as "dead, dangerous, incurable.... »

This is similar to other patient searches (Vieira et al., 2017) that frequently used the terms "bad" or "dangerous" in their depictions of HIV.

In addition, we found that students report STIs through multiple, unprotected sex, due to germs from an infected partner and synonymous with dangerousness and social taboos.

Contact with contaminated blood and soiled objects recorded low percentages of responses as if STIs were related to sin and only come from eligible sexual relations.

This diagnosis is confirmed by the responses to question B.5 of the interview, where all the students ticked sexual intercourse as the main way for transmission of STIs, followed by "mother-foetal way" and "blood way".

The misconception of future midwives on STIs (taboos, sin, illicit intercourse...) has been noted among Portuguese teachers, in other studies despite the difference in socio-cultural context (Anastácio, Carvalho & Clément, 2008).

The learners' responses on the mind map A.2 and questions B.1, B.2, B.3 and B.5 of the interview confirm this misconception and prove that it has deep roots.

Indeed, for question B.1, the students reported that the main causes of STIs were "unprotected sex, illicit sex, out of wedlock. “In addition, even some of them answered that the "husband" is one of the causes of STIs with the idea that it is the husband who drags and "brings the germ" to his wife, which is a representation of Muslim and Moroccan society in particular.

The wife is always a symbol of purity and fidelity, it is the husband who can be “unfaithful” and have other sexual relations outside of marriage, and this is noted in the responses to question B.3 where learners noted "divorce" as a complication of STIs.

This misconception of associating STIs to sin, illegal relations, sexual relations and taboos presents sociological obstacles (linked to the common misconceptions of Muslim and Maghreb communities).

This misconception was also found in other responses to question B.3 where the majority of students reported that the main complication of STIs is "death" or "psychological" and "social" harm, which confirms that they dramatize the sexual infection and take it as a "deadly" disease. However, scientific aspects such as "infertility", "damage to other organs" and "damage to the immune system" accounted for a small percentage of their responses.

As for the responses to question B.4, most of the learners recognized "AIDS" and "syphilis" among STIs, a minority recognized soft canker, gonococcal disease and some had gaps in their knowledge of STIs: for them "HIV" and "trichomonas vaginalis" were STIs. This shows that they do not differentiate between the causal agent and the disease and even some of them responded that tuberculosis, cancer...are STIs.

These results are similar to those found in other international studies among university students (Rochigneux, 2012).

This poor knowledge of STIs could be due to the following reasons:

Didactic obstacles (Khennoussi & Chahlaoui, 2018) related to the linear approach adopted in textbooks in relation to STIs or the dominant pedagogical style, which is of an injunctive informative type (Bernard *et al.,* 2007).

These didactic obstacles may also be rooted in teachers' misconceptions (Selmaoui *et al.,* 2010) in our Moroccan STI system, a finding that has been noted in several national studies (Khzami *et al*., 2012; Selmaoui *et al*., 2010).

Almost all students have mastered the modalities of STI transmission, as they recognized the sexual transmission as the main mode, followed by the blood and mother-foetal transmission and the use of soiled objects. A minority of those who responded that mosquito bites, kissing and sweating could be routes of STI transmission. This misconception has been diagnosed in other studies such as the one in Yemen among a similar population (Al-Rabeei *et al.*, 2012).

For question B.2, the majority of students cited most of the symptoms of STIs in the genital tract, indicating that they had assimilated the prerequisites related to this knowledge, but only four students reported general symptoms of these infections.

This could be another misconception for them that STIs only occur in the genital tract and not in other organs (such as ganglion inflammation due to AIDS syphilis, retinitis due to syphilis, jaundice due to hepatitis B...).

As for the responses to question B.7, almost all the students were unaware of the existence of vaccines against STIs (such as the vaccine against papillomas-virus infections, which is responsible for cervical cancer, and the vaccine against hepatitis B...).

This ignorance of the existence of vaccines against STIs could be due to the fact that the students' misconception was that STIs as long as they are sexually transmitted cannot have a vaccine and that the vaccine is only designed for non-sexually transmitted diseases such as (measles, tetanus, smallpox...).

This diagnosis refers to an epistemological obstacle from the history of theories (the Pasteurian theory (Boucher, 2011), or the popularization of immunological theories (Jacobi, 2010; Metchnikoff, 1892; Moulin, 1991)) where the vaccine was made from bacteria or toxins that have lost their "toxic" function and whose purpose is to mitigate epidemics (smallpox...) and not to prevent STIs.

For the responses to Question 11 of the interview on the sources of information on STIs for midwives students, the media and the internet come in the second place and constitute a main source of their information on infections.

These sources of information could convey misconceptions that lack reliable references and scientificity and rigor.

These results are similar to those found in other national (Selmaoui *et al.,* 2010) and international (Rochigneux, 2012) research, whether with health professionals or other target audiences (high school students, adolescents, teachers, etc.).

Overall Conclusion and Outlook

The results obtained in this work, although not of an evaluative nature and aimed only at setting an example; suggest that the teaching of health sciences would probably pose a serious problem.

We find that the student develops misconceptions that hinder her learning process in the graduate program. Moreover, these conceptions are influenced by the learner's environment. In this study, the views of future midwives largely reflect the ideas of the media and their society, with which they even share the "habitus"; these cultural and belief barriers may hinder the development of their skills in managing STIs. We add to these obstacles those previously noted: epistemological, didactic, causal reasoning, verbal and the obstacle of forgetting.

Not forgetting the language barrier, which represents a major difficulty in learning knowledge in scientific fields and which has been diagnosed among Moroccan university students (Abdellatif et al., 2013).

In the absence of a specific course, the misconceptions of future midwives induce errors that necessarily constitute obstacles to the acquisition of knowledge related to STIs.

Indeed, the teacher's work should not be limited to identifying obstacles, but should consider them in the design, development and implementation of the various pedagogical interventions. The different phases of the teaching act must be structured to assimilate scientific knowledge based on the confrontation of a large number of obstacles. In addition, this, by adopting an active methods and reflective teaching approaches as “the flipped classroom”, by using mind maps, simulation (videos, models...) and by adopting formative evaluation to regulate these learning practices.

An analysis that is both global and specific should arise on issues related to curricula, programs, vocational training and the quality of science teaching at university level.

Finally, we conclude that the knowledge of future midwives about STIs is reasonable and superficial and requires special teaching.

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