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The Percentages of the Lower Extremities' Medical Problems in Three Medical Centers in Riyadh (Saudi Arabia) Among Adults and Pediatrics Reported Over 2 Years Duration

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Abstract: **The lower limbs medical problems whatever their type and severity? Still considered one of the daily challenges for the doctors in the hospitals and outpatient clinics. And besides the congenital ones still we are facing accidentally acquired lower limb traumas that increased recently all over all the world due to car accidents. Among this study we selected only the common congenital defects in both categories of the patients (Childrens and adults) visiting our concerning centers, and since of our excellent field we are specialized in, where one of us in the military field medical services, one in the hospital outpatient clinic of the family medicine and one in the pediatrics orthopedic subspeciality which will made the study rich, deep and more productive. We selected that we think they were the comments three orthopedic lower limbs medical problems in KSA populations, In-toeing (IT), Flat-Feet (FF that in the +pediatrics group should be above 3 years old) and stress-Fractures (SF).**

Keywords: **lower limbs medical problems, outpatient clinics, limb traumas, (Childrens and adults).**

Abbreviation:

Flat feet: FF.

In-toeing: IT.

Stress fracture/s: SF/s.

pes planus: PP.

pes cavus: PC.

Pigeon toe: PTO.

Riyadh: RUH.

KSA: Kingdome of Saudi Arabia.

King Abdulaziz Medical City- Outpatient Clinics: KAMC-OPC.

King Abdulaziz Medical City- Medical Field Clinic: KAMC-MFC.

Ministry Of Health- King Fahd Medical City: MOH-KFMC.

CG/s: Care giver/s.

TRA/s: Traffic car accident/s.

Hx: History.

PE: Physical examination.

LL: Lower limbs.

FU: Follow up.

PT: Physiotherapy.

MRI: Molecular resonance imaging.

Adult/s: AD/s.

Child: CH.

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1. INTRODUCTION

(Flat Feet): Among arch abnormalities of the feet, flexible PP (FF) is most common and typically describes functional flat feet that are physiologic and asymptomatic. Patients with painful flexible PP warrant evaluation for associated ligamentous laxity, tight heel cords, and tibialis posterior tendon dysfunction. Rigid PP (FF) and PC (fixed high arch) warrant specialty referral to evaluate underlying abnormalities such as tarsal coalition (PP), neuromuscular disease (PC), or talipes equinovarus (residual club foot causing PC).

Rigid pes planus (flat feet) — PP and flat feet **(Figure 1)** are the terms used to describe feet with moderate or complete loss of the longitudinal arch. PP can be classified radiographically according to the degree of depression of the lateral talometatarsal angle. However, a clinical classification can also be used for evaluation and treatment of this common condition. The clinical classification divides PP into two general categories: rigid and flexible. This distinction depends upon the mobility of the tarsal and subtalar joints.

(Figure 1: The FF or PP) (1).

Rigid PP is diagnosed when:

- Range of motion at the tarsal and subtalar joints is decreased AND
- The arch does not increase with toe raising. (2)

Flexible pes planus (PC) — has three types:

- **Type I** – Functional flat foot (calcaneovalgus)
- **Type II** – Hypermobile flat foot with associated ligamentous laxity and "tight heel cords"
- **Type III** – Clinical PP associated with tibialis posterior tendon dysfunction. (2)

Clinically: There are two forms of the cavus foot deformity. One has an inverted calcaneus with a tight heel cord (the cavovarus foot). The second has a high arch with a normal heel alignment, usually from weak calf muscles and increased dorsiflexion of the heel with increased plantarflexion of the forefoot. This form is called calcaneocavus.

The symptoms of the cavus foot can be static or progressive. The course is typically static in idiopathic cavus foot and progressive if the deformity is caused by a neurologic disease. Patients with idiopathic cavus foot prefer to wear shoes or boots with elevated heels to relieve the stress on the tight heel cords and the plantar fascia.

On examination, the deformity is present with and without weightbearing. The toes may be clawed. Asymmetry of the muscle bulk of the calves should be evaluated with the patient standing. Gait should be evaluated for the presence of foot drop. The heel cords should be tested for tightness by determining the extent of dorsiflexion of the foot. Patients with tight heel cords are unable to dorsiflex the foot beyond the neutral position. The lower spine should be evaluated for neurocutaneous markings (suggestive of spinal dysraphism). Muscle strength and sensation of the foot should be tested.

For the purpose of evaluation and treatment of the young athlete with a cavus foot, categorizing the deformity according to function (eg, flexible, semiflexible, and rigid) is helpful.

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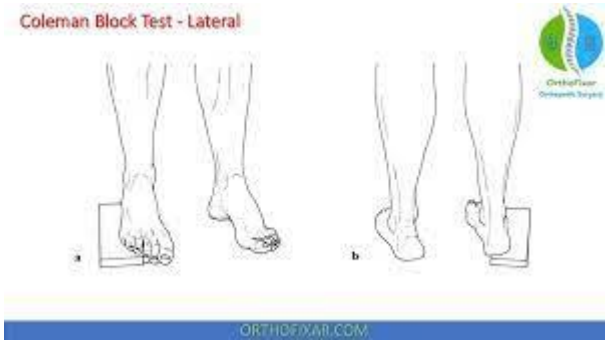
These categories can be defined by determining the mobility of the hindfoot on the forefoot using the Coleman standing lateral block test and the Carroll test (3). **(Figure 2).**



(Figure 2: the Coleman standing lateral block test) (4).

(In-toeing):

In-toeing (PTO) is a rotational variation of the lower extremity where the feet or toes point toward the midline during gait **(Figure 3).**

(Figure 3: IT or PTO) (5).

IT is one of the most common anatomic musculoskeletal variations encountered by paediatric primary care providers and a frequent reason for referral to a paediatric orthopaedic surgeon. However, most children with IT have variations of normal lower-extremity development that will improve spontaneously and can be monitored by the primary care provider **(6).**

The most common causes of IT originate from the foot (metatarsus adductus), lower leg (internal tibial torsion), and hip (increased femoral anteversion). These conditions may occur in combination, which increases the severity of IT. They generally do not cause pain or interfere with development or stability of gait, although children with in-toeing may stumble or trip more frequently than other children, particularly when they are tired.

Age <1 year: Metatarsus adductus — Metatarsus adductus is characterized by angulation at the midfoot, with the metatarsals pointing toward the midline relative to the hindfoot. This gives the foot a "kidney bean" or "C" shape. Metatarsus adductus is the most common congenital foot deformation and the most common cause of IT in infants younger than one year.

Metatarsus adductus is thought to result from intrauterine molding or variations in anatomy. It may be associated with other "packaging problems," such as torticollis. It appears to be more common in twins, although the incidence is similar in preterm and term infants. An association between metatarsus adductus and developmental dysplasia of the hip has been noted in some, but not all, studies.

The true incidence of metatarsus adductus is difficult to determine because mild variations generally are not reported. It is estimated to occur in up to 3 percent of term newborns. It is more frequent in females than males and appears to run in families.

Metatarsus adductus is often bilateral; when unilateral, it occurs more often on the left than on the right (for unknown reasons). On examination of the foot, the heel bisector line is lateral to the second toe web space. The hindfoot is in the neutral or valgus position, and the range of motion of the ankle and subtalar joint are normal.

Age 1 to 3 years: Internal tibial torsion — Internal tibial torsion is characterized by internal (medial) rotation of the tibia. It is the most common cause of IT in children between one and three to four years of age and typically noticed when children begin to walk.

Internal tibial torsion affects males and females equally. It does not occur in premature infants. External tibial torsion is more likely in premature infants.

Internal tibial torsion is bilateral in approximately two-thirds of cases; in unilateral cases, the left side is more commonly involved for unknown reasons. Internal tibial torsion is associated with metatarsus adductus in approximately one-third of cases. It is often associated with, and may accentuate the appearance of, physiologic tibia vara and bowlegs.

Characteristic examination features of internal tibial torsion include:

● When standing or walking, the foot points inward (an inward foot progression angle), and the patella points straight ahead or outward (a neutral or external patellar progression angle)

● The medial malleolus is level with or posterior to the lateral malleolus (with the child seated with the thigh directly in front of the hip joint and the knee pointed straight ahead)

● In the prone position, the thigh-foot angle is internal.

Internal tibial torsion typically resolves by five years of age. As the child grows, the tibia spontaneously rotates laterally. The average thigh-foot angle changes from -5 degrees (medial or internal) at birth to 15 degrees (lateral or external) at maturity. However, wide variation of tibial rotation is common. An internal thigh-foot angle of 20 degrees falls within 2 standard deviations (SD) of the mean in infants and toddlers.

Management of internal tibial torsion is discussed below.

Age 3 and older: Increased femoral anteversion — Femoral version is the angular difference between the axis of the femoral neck and the transcondylar axis of the femur. Increased femoral anteversion (also called medial femoral torsion) is associated with increased internal rotation and decreased external rotation at the hip.

Increased femoral anteversion is the result of intrauterine moulding and genetic inheritance. It is twice as common in females as in males.

Increased femoral anteversion usually is diagnosed between three and six years of age; before three years, it is masked by the physiologic external rotation contracture of the hip. IT due to increased femoral anteversion may increase until five to six years of age and then gradually decreases. Increased femoral anteversion does not cause pain.

Characteristic clinical features of increased femoral anteversion include:

● When standing, the patellae face medially

● When walking, the toes and patella point toward the midline (internal foot progression angle and internal patellar progression angle)

● "Eggbeater" or "windmill" pattern during running (the legs flip laterally during the swing phase, when the foot is off the ground)

● Increased internal rotation and decreased external rotation of both hips (symmetric).

● Preference for sitting in the "W" position; uncomfortable sitting cross-legged until lateral rotation of the hip improves. **(7)**

(Stress Fractures):

SFs of the tibia and fibula occur in many athletes, especially runners, and also in non-athletes who suddenly increase their activity level or have an underlying illness predisposing them to SFs. Many factors appear to contribute to the development of these fractures including changes in athletic training, specific anatomic traits, decreased bone density, and disease states.

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Initial symptoms in most athletes with a SF of the tibia or fibula may resemble medial tibial stress syndrome (MTSS), commonly referred to as "shin splints," although the time course is typically longer and the pain more focal. In most cases of lower extremity SF, there is a gradual progression of activity-related pain over several weeks to possibly months. Athletes often report an increase in training volume or intensity. Eventually, pain worsens and may occur with rest. Occasionally, the patient experiences an abrupt increase in pain at the site of milder chronic symptoms, indicating that a repeatedly stressed area of bone has finally fractured. (See

Diagnosis of a tibial or fibular SF is based upon a suggestive history, usually in a patient with risk factors, and the clinical findings listed immediately below:

- Pain localizes to one discrete area of the leg
- Local swelling and focal bone tenderness are present
- Pain increases with impact (eg, running or jumping)
- Positive hop test is strongly suggestive (should be performed cautiously if there is concern for severe injury)

In most cases, MRI is the preferred study for the evaluation of stress fractures when a definitive diagnosis is required (Figure 4) With regard to tibial and fibular SF, MRI may be particularly helpful because it helps to differentiate SF from shin splints and demonstrates high sensitivity and specificity. When an intra-articular stress fracture is suspected, MRI better differentiates bone injury from ligament or cartilage injury. Cost and lack of access to MRI may lead some clinicians to reserve its use for possible high **(8).**

(Figure 4: A, a fracture line can be seen that extends across approximately 80 percent of cortex. A lateral view of the same SF (B) shows the fracture line crossing the entire antero-posterior width of the tibia. In image C, a SF of the proximal anterior tibia has a stellate appearance and is surrounded by oedema) (8).

(THE AIM OF THE STUDY):

To count the prevalence, complications, and patients' satisfaction about the doctor management for the concerned three medical orthopedic problem.

2. THE METHOD OF THE STUDY

(The design of the study):

is a cross-sectional type of study.

(The setting of the study):

The study was done in three medical centers in RUH, these centers are KAMC-OPC, KAMC-MFC, and MOH-KFMC ***(Last center the data started to be collected since August of 2023).***

(The tool of the study):

We completed our study in cooperation with the medical records section of all the previously mentioned medical centers. We selected the random cases, we interviewed with them and done the physical examination and the required the required radiological studies then we followed up them through one year to detect at least the possible complications and satisfaction about their futural medical outcome. The selected cases were as follows: 187 cases out of 678 (Pediatrics and adults) from KAMC-OPC, 221 cases out of 470 (Adults) from KAMC-MFC and 316 cases out of 410 (Pediatrics)from MOH-KFMC this last center the data just started to be collected since august 2023. The whole number of the study was 1558 patients.

The classification of the patients was based on the underlaying congenital orthopedic problem (FF, IT and SF. After that we proceeded to do their prevalence (Of the own sample only) and the related complications, satisfaction of each from the side of the patient and CGs.

_The style of the study was achieved as cross-sectional one, the field of the study was in the out-patients' clinics of the targeted medical centers mentioned previously , All the patients more than 3 years old (to exceed the physiological limit of the children's FF) every patients involved has been activated by the front reception of the clinic and the patients' medical records information's have been confirmed with a signature on a consent (agreement to be involved In the study) then proceeded to the vital signs records among which the nurses asked the CG or the patient himself about any significant previous medical history related to the LL mainly presence of previous TRAs and the vital signs have been registered. Then the patients transferred to the physicians who concerned During which a counselling with each one again was done with detailed Hx and PE taken among which also we offered the needed radiological studies to confirm the final diagnosis.

On the leave the patients and the CGs we gave them our questioner that mainly inquiring about their major visit complaint and the faced complications behind such complaint joined with their impression and satisfaction about the way we offered for them regarding to the FU even if there were no any treatment of PT given in the visit.

The patients and the CGs communications channels established via their mobile number WhatsApp and their personal email and agreed to send the questionnaire after one year exactly from their first visit.

The most important data we needed from the replay were:

*What was the LL medical diagnosis told by the physician?

**What was the suggested management?

***Any complication among such one year of the FU and the answers of that will be

Either Y (yes) or N(no).

****The degree of the satisfaction about the plan of the management decision as if it classified as follow:

A) _ Complete satisfaction: A.

B) _ Partial satisfaction: B.

C)_Unsatisfied: C.

After collecting the data a subsequent analysis has been done and summarized on the table you will see in the section of the results.

3. RESULT

From KAMC-OPC and out of the 678 pediatrics and adults' patients we confirmed 97 Childs with FF who are above 3 years old, 5 Childrens with IT and 85 adults with FF and no SF cases have been recorded.

From KAMC-MFC and out of the whole 470 adults' cases we confirmed 91 cases with SF,100 cases of FF and 30 cases of Congenital IT. From MOH-KFMC and from the whole 410 patients there were 77 children with IT, 220 with FF and 19 cases of SF. We account one orthopedic problem which is more apparent if the patient had more than one of them from the three congenital problems we evolved in our study.

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Regarding to the complications recorded from all the selected cases nothing recorded as a major complication like (disabilities, sever LL pain, psychological disturbance, social sequels)

Regarding to the satisfactions of the patient or their CG about the management and reassurance plane we found that only 110 ones were satisfied out from 187 of the KAMC-OPC (22 adults and 88 were real CG), 190 patients only (out of 221) satisfied from the KAMC-MFC, and 222 one out if 316 stultified from MOH-KFMC (all were CGs).

The **(Table 1)** below appreciates all the net result of the current study clarifying them in the order of the medical center name, type of the deformity registered.

Deformity NO/Medical center.	KAMC-OPC (187/ 678).	KAMC-MFC (221/470).	MOH-KFMC (316/410).
FF (No).	97	100(AD).	220(CH).
IT (No).	5 (CH)/AD (0).	30(AD).	77(CH).
SF (No).	0	91(AD).	19(CH).

(Table 1: Cases distribution of the study according to the orthopedic deformities and the medical centers).

(Table 2) below shows the net-result of the complications registered and the patients (also the CGs) satisfaction from each deformity in correspond to the medical centers involved in the study.

Medical centers/Satisfaction	%	Comments
KAMC-OPC (187/ 678).	58%	22 AD &88 CGS
KAMC-MFC (221/470).	85%	---------
MOH-KFMC (316/410).	70%	All were CGs

(Table 2: Cases distribution of the study according to the patients & CG/s satisfaction and the medical centers).

4. DISCUSSION

For the three orthopaedic medical problems we are talking about in such study the plane of the management depends basically on the suspected complications of them and the milestone strategy of all is the FU (with occasional PT sessions if needed).

Regarding to the FF the most well-known complications are:

- Toe deformities: bunion or hammer toes.
- Chronic pain in the feet, ankles, knees, and hips
- Instability
- Plantar fasciitis
- Morton's neuroma (9).
- Achilles's tendonitis, an inflammation of the tendon that inserts at the back of the heel. (2)
- Metatarsalgia
- Osteoarthritis
- Hallux valgus
- Claw or hammer toes
- Plantar Fasciitis (Calcaneal Spur), inflammation of the ligaments in the soles of the feet
- Posterior tibial tendonitis
- Wound over the navicular bone (10).

No real Direct complications commonly seen with IT, but the interplay between possible associations between the conditions should be considered. Metatarsus adductus is attributed to intrauterine positioning, and the clinician should be aware that other comorbidities associated with intrauterine positioning include torticollis and developmental dysplasia of the hip, which is commonly bilateral. (11)

About the long term of SF Complications are generally few for low-risk stress fractures. Occasionally the patient may experience residual pain. High-risk stress fractures carry considerably higher risks. They are more likely to progress toward non-union and thus require surgical treatment. They are more likely to necessitate a change in the sport for an athlete and may result in greater post-recovery pain (12).

Studies from the Medline searches that me mike and support my study they only taking about a statistic without mentioning any replaying opinions from the patients or CGs satisfactions regarding to the management plan.

It is estimated that about 20% to 37% of the population has some degree of pes planus***. [Munro BJ, Steele JR. Foot-care awareness. A survey of persons aged 65 years and older. J Am Podiatr Med Assoc. 1998 May;88(5):242-8. [Otsuka R, Yatsuya H, Miura Y, Murata C, Tamakoshi K, Oshiro K, Nishio N, Ishikawa M, Zhang HM, Shiozawa M, Kobayashi A, Ito M, Hori Y, Kondo T, Toyoshima H. [Association of flatfoot with pain, fatigue and obesity in Japanese over sixties]. Nihon Koshu Eisei Zasshi. 2003 Oct;50(10):988-98. [Lauterbach S, Kostev K, Becker R. Characteristics of diabetic patients visiting a podiatry practice in Germany. J Wound Care. 2010 Apr;19(4):140, 142, 144 passim.]*** A majority of these cases are flexible pes planus. A 2003 study by Dunn et al. found that the prevalence among non-Hispanic whites was 17% and greater among African Americans at a rate of 34%.***[Dunn JE, Link CL, Felson DT, Crincoli MG, Keysor JJ, McKinlay JB. Prevalence of foot and ankle conditions in a multiethnic community sample of older adults. Am J Epidemiol. 2004 Mar 01;159(5):491-8]*** There is a 1:1 ratio of men to women. [***Aenumulapalli A, Kulkarni MM, Gandotra AR. Prevalence of Flexible Flat Foot in Adults: A Cross-sectional Study. J Clin Diagn Res. 2017 Jun;11:AC17-AC20.]*** It is typically more common in children, but most children develop a normal arch by the age of 10. There is a strong genetic component of pes planus, and it typically runs in families.***[Pita-Fernandez S, Gonzalez-Martin C, Alonso-Tajes F, Seoane-Pillado T, Pertega-Diaz S, Perez-Garcia S, Seijo-Bestilleiro R, Balboa-Barreiro V. Flat Foot in a Random Population and its Impact on Quality of Life and Functionality. J Clin Diagn Res. 2017 Apr;11(4):LC22-LC27]*** The radiographic or clinical presence of pes planus may be an incidental finding in patients and requires clinical correlation (13).

The prevalence of in-toeing in children has been described to be between 13.6% and 14.5%. However, a 30% prevalence in four-year-old children and a more frequent distribution of bilateral in-toeing compared to unilateral in-toeing have been reported. Gait abnormalities caused by in-toeing like stumbling are common reasons for referrals of preschool children to paediatrics orthopaedic specialists***[Gait & Posture ,Volume 66, October 2018, Pages 70-75Gait & Posture ,Volume 66, October 2018, Pages 70-75]***

Overall stress fracture incidence is about three cases per 1,000 in active duty Servicemembers, but it is much higher among Army basic trainees: 19 per 1,000 for men and 80 per 1,000 for women***, [J Spec Oper Med2017 Summer;17(2): 120-130.doi: 10.55460/SPMB-1E6L.].***

It looks very frank from the results of the study how common is the FF in the KSA society? and since of the highly educated community there is wide spectrum of the people who are satisfied about the plane of the management of the problem which is mainly the FU.

(Conclusion): At least throughout our brief local study, the commonest congenital orthopedic deformity among the three types we selected initially (FF, IT, SF) in AD and CHs was FF without any noticed complications through the FU, and with a very good degree of satisfaction about the management plane from the patients and their CG for at least for all the three medical problems.

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