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PREVELANCE OF SUPERFICIAL MYCOSES AMONG OUTDOOR PATIENTS IN A TERTIARY CARE HOSPITAL

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Abstract

Background: The dermatophytes are a group of closely related keratinophilic fungi that invade keratinised tissues-skin, hair and nails of humans and animals. Superficial mycoses have become a significant health problem affecting children, adolescents and adults in developing countries. This study was conducted to find the prevalence of dermatophytoses among outdoor patients in a tertiary care hospital.

Methods: The present study included 400 patients attending the Dermatology out patient department at Eras Lucknow Medical College and Hospital who were clinically suspected to have superficial mycoses. The present study was planned to characterise the different dermatophytes, budding yeast like fungi in various types of superficial mycoses cases. Skin scraping, hairs stubs and nails were examined by direct microscopy (KOH mount) and culture on Sabourauds dextrose agar. Further speciation was done by micro slide culture technique.

Results: Most common clinical presentation was T.capitis and most common fungal isolate was *T.mentagrophytes*.

Conclusion: The present study was undertaken to describe the prevailing spectrum and frequency of various fungal isolates causing dermatophytosis .

Key words: Dermatophyte, superficial mycoses, slide culture

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Introduction:

The dermatophyte is a group of keratinophilic fungi that invade keratinised tissues-skin, hair and nails of humans and animals and produce an infection called as dermatophytoses¹. At least 10% of world's population has dermatophyte infection². Superficial mycoses or superficial cutaneous fungal infections are the Dermatophytes colonise superficial dead or desquamating layers of skin and its appendages.. Superficial mycoses are the most common mycotic infections world wide, which involve outermost covering of skin and its appendages like hair and nail. Nails and hair follicles are the particular sites invaded by dermatophytes³ Dermatophytes are included in the Gymnoascaceae, a family of largely soil borne moulds with an affinity for keratin as a growth substrate. They are divided into 3 ecological groups-Anthropophilic, Zoophilic, Geophilic.

Routes of infection are believed to include direct contact with other human beings, an animal or soil that is already infected as well as spread by means of mats in gymnasiums, floor coverings, dirty clothing, shelves, public baths and jointly used footwear carrying scales or hair contaminated with dermatophytes.

Superficial mycoses have become a significant health problem affecting children, adolescents and adults in developing countries Dermatophytes are by far the most significant cutaneous fungi because of their widespread involvement of population and their worldwide prevalence. The patients invariably try to neglect such type of infections and seek medical attention usually for cosmetic reasons and not because of discomfort. Infections with dermatophytes are generally confined to keratinized stratum corneum. This superficial site of infection may protect the infecting dermatophyte from direct contact with some of the effector cells of immune system⁴. A higher incidence of dermatophytes in males in comparison to females has been reported both in India and abroad.⁵

The great variation in clinical presentation of fungal infections is related to involved species and strain of fungus, size of inoculum, involved

sites and immune status of host. The clinical manifestations are as follows: (i) Tinea barbae (ringworm of the beard and moustache); (ii) Tinea capitis (scalp, eyebrows, and eyelashes); (iii) Tinea corporis (glabrous skin); (iv) Tinea cruris (groin); (v) Tinea favosa (favus); (vi) Tinea imbricata (ringworm caused by *T. concentricum*); (vii) Tinea manuum (hand); (viii) Tinea pedis (feet); and (ix) Tinea unguium (nails). Several anatomic sites may be infected by a single dermatophyte species, and different species may produce clinically identical lesions as and when host's resistance is reduced, prevalence of dermatophytes can be extremely high and symptomatology may be very unusual.

The dermatophytes are hyaline septate moulds with more than hundred species. They are divided in to 3 main anamorphic genera depending on their morphological characteristics ie. *Trichophyton* species, *Microsporum* species and *Epidermophyton* species.

The *Trichophyton* spp. usually infect skin, hair and nails, *Microsporum* species infect skin, hair and not nails. *Epidermophyton* spp. infect skin as well as nails but not hair⁶. Species identification is largely based on the morphology and arrangement of the conidia. However, a few simple physiological tests may be required to confirm their identification especially of the *Trichophyton* species⁷.

The prevalence of various types of fungal infections varies according to geographical distribution of various fungi and their natural habitat on one hand and a number of host factors on other. The spectrum of infection varies from one geographical area to other. Fungal infections of the skin, hair, and nails are common worldwide, and their incidence continues to increase. The principal causative agents are dermatophytes, and their geographic distribution is variable. This is reflected in the differing patterns of dermatophytoses seen in different parts of the world. The epidemiology of dermatophyte infection has changed as a result of migration, lifestyle, drug therapy, and socioeconomic conditions. This contribution discusses global patterns of dermatophyte infection

and the changing epidemiology of the causative agents⁸.

Surveillance of fungal infections is important to define their burden and trends to provide the infrastructure needed to perform various epidemiological and laboratory studies and to evaluate interventions. Surveillance systems require following basic elements—a clear case definition, a defined population, mechanisms for reporting, analysis and disseminating the data and incentives to conduct surveillance. For fungal diseases, each one of these elements presents distinct challenges⁹.

Material & Method:

The study was conducted in the Department of Microbiology, Era's Lucknow Medical College and Hospital, Lucknow. Clinically suspected cases of superficial mycoses amongst individuals belonging to various age groups attending outpatient Department (OPD) of Dermatology & Venereal Diseases of Era's Lucknow Medical College (including patients from Urban and Rural health centers of this college) during period of 1 year (Jan 2012-Jan 2013) were subjected to clinico mycological workup after taking informed written consent from the patients. Patients attending the skin OPD were explained about the study and asked to participate. 400 suspected patients were included in the study. All patients suspected of fungal infection on the basis of clinical presentation were enrolled. Patients receiving antifungal therapy were excluded. Demographic data mainly age, gender, occupation was recorded for each patient. Clinical history of present illness and specific risk factors for superficial mycoses e.g. Diabetes mellitus, tuberculosis, jaundice was obtained. History of present or past anti fungal treatment was noted. Skin, hair or nail specimens were collected in the department of Microbiology in Era's Lucknow Medical College and Hospital, Lucknow. Skin scraping, hairs stubs and nails were examined by direct microscopy and culture. Specimens were cultured in duplicate media for the isolation of dermatophytes, and yeast on SDA. Fungal isolates were identified by preparing LCB mount and further confirmation was done by micro slide

culture technique. Skin scraping, hairs stubs and nails were examined by direct microscopy and culture. Specimens were cultured in duplicate media for the isolation of dermatophytes, and yeast on SDA. Fungal isolates were identified by preparing LCB mount and further confirmation was done by micro slide culture technique.

Results:

Of the total enrolled cases, 316(79%) cases belonged to Dermatophytoses followed by 42 (10.5%) cases of Pitryiasis versicolor and 42(10.5%) cases of superficial candidiasis. T.capitis was most common in 0-10 yrs (11%), T.corporis was most common in 21-30 yrs age (5%), T.pedis was most common in 31-40yrs age (2%), T. manuum was most common in 21-30 and 51-60yrs age (1.5%), T. unguium was most common in 21-40yrs age (3%), T. faciei and T.cruris was most common in 21-30 yrs age (1.5%),. Maximum number of 97 (24.25%) cases were in the 21-30 yrs age group, Least common age group involved was 71-80 yrs (2.5%). The male:female ratio was equal in patients of T.capitis. (1:1) In all other clinical types males outnumbered females, the difference being statistically significant, ($\chi^2=40.96$, $p<0.001$).

Majority of cases were students (30%) followed by housewives (14.5%), skilled persons (14%), farmers (13%), service class and professionals (11%), unskilled labourers (6.5%), businessmen (6.5%) and infants and toddlers (4.5%).(skilled-trained in any profession eg carpenter, unskilled-untrained person).

KOH Positivity and Culture Correlation

Of the total 400, cases 326 (81.5%) were KOH positive and 74 cases (18.5%) were negative for fungal elements. However, 292 (73%) cases were culture positive and 66 (16.5%) were culture negative for fungal elements. 22 (5.5%) cases were negative for fungal elements both by direct microscopy and culture. Culture was not done for PV cases. Out of total 292 (100%) cases *T. mentagrophytes* was the commonest dermatophyte

isolated from 56 (19.2%) cases followed closely by *T. tonsurans* 50 (17.1%) cases, *T. verrucosum* 33 (11.3%), *T. schoenleinii* 24 (8.21%), *M. ferrugineum* 23 (7.87%) *T. soudanense* 17 (5.82%), *M. audouinii* 16 (5.47%), *T. rubrum* 9 (3.08%), *E. floccosum* 9 (3.08%), Nondermatophytic moulds were isolated from 24 (8.21%) cases. Majority of cases belonged to *T. unguium* cases. *Candida albicans* was isolated from *T. capitis*, *T. corporis*, *T. manuum*, *T. faciei*, *T. unguium* and *T. cruris*. *Candida non albicans* was isolated from *T. capitis*, *T. corporis*, *T. manuum*, *T. faciei* and *T. cruris*. In the *T. capitis* most common isolate was *T. tonsurans*, in *T. corporis*, *T. mentagrophyte* was isolated. *T. verrucosum* and NDM were isolated from *T. unguium* cases most commonly. From *T. manuum*, *T. mentagrophyte* and *Candida spp.* were isolated. From cases of *T. pedis* NDM was most commonly isolated followed by *T. mentagrophyte*, *T. soudanense* and *T. verrucosum*. From cases of *T. cruris* *T. mentagrophyte*, *T. verrucosum* and *Candida spp.* were isolated. From *T. faciei*, *T. tonsurans* and *Candida spp.* were most commonly isolated.

Discussion:

This study was conducted to evaluate distribution of various dermatophytes among suburban population at Lucknow. The spectrum of various fungi causing superficial mycosis has not been recently documented from our region and treatment is empirical. Therefore, the present study was undertaken to describe the prevailing spectrum and frequency of various fungal isolates causing dermatophytosis along with their distribution among suburban population. The present study included 400 patients attending the Dermatology OPD at our institution who were clinically suspected to have superficial mycoses. These patients were referred to our department for detection of fungal elements in the skin, hair and nail specimens. Out of these 400 patients, 316 (79%) were found to be dermatophytoses, 42 (10.5%) Pityriasis versicolor and 42 (10.5%) superficial candidiasis.

In our study most of the patients belonged to the age group of 21-30 yrs (24.25%), followed by 11-20 yrs (17.75%) and 0-10 yrs (15%). Least common age group involved was 71-80 yrs (2.5%). Other age groups involved were 31-40 yrs (14.25%), 41-50 yrs (11.5%), 51-60 yrs (9.25%), 61-70 yrs (5.5%).

Dermatophytic infections are most common in adults aged 16-45 yrs.^{11,12,13}. The post pubertal changes in hormones resulting in acidic secretions from sebaceous glands are responsible for the decrease in incidence with age.

Most of patients (85%) studied were of low socioeconomic status. 10% of the patients belonged to middle class and 5% patients belonged to higher socioeconomic group. Most of the cases studied comprised of students (30%), followed by housewives (14.5%), skilled persons (14%). Farmers accounted for 13% of the subjects, professionals and service class persons were 11%, labourers were 6.5%, businessmen involved were 6.5%, infants and toddlers were 4.5%.

In the present study *T. capitis* (25%) was the most common clinical presentation followed by *T. corporis* (20%), *T. unguium* (15%), *T. pedis* (6%), *T. faciei* (5%), *T. manuum* (5%), *T. cruris* (3%), *T. pedis*+*T. unguium* (3%), *T. manuum* +*T. unguium* (4%), *T. capitis* + *T. corporis* (3.5%). Pityriasis Versicolor was seen in 10.5% of cases. Only few studies from India and abroad have shown *T. capitis* as the most common presentation¹⁴. *T. capitis* was the most common clinical presentation (25%) in our patients.

The next most common clinical presentation was *T. corporis*. Males outnumbered females. *T. corporis* on or below the waist line is commonly seen in Indian women due to typical Indian costume i.e. sari and salwaar-kameez¹⁵. In the present study, the incidence of *T. unguium* was 15%. It was found most commonly in the 21-30 yrs and 31-40 yrs age group but not in 0-10 yrs age group. It was more commonly seen in males. Male:female ratio was 2:1. In the present study, the incidence of *T. pedis* was 6%. It was seen more commonly in the age group of 31-40 years. It was common in males,

male:female ratio was 3:1. It was mostly seen in farmers and skilled persons (1.5%) followed by housewives and unskilled labourers.

T. manuum was seen in 5% of our patients. Males were affected more than females. Male:female ratio was 1.5:1. Most common age group involved was 21-30 yrs and 51-60 yrs and was not seen in 0-10 and 71-80 yrs age. It was seen that patients whose occupation involved excessive use of hands were most likely to develop *T. manuum* at early age¹⁶. In this study *T. faciei* was seen in 5% of patients. Male:Female ratio was 1.5:1. It was most common in the 21-30 yrs age group followed by 51-60 yrs age group and was not seen in 71-80 yrs. In the present study incidence of *T. cruris* was 3% and it was most commonly seen in males in the age group 21-30 years.

In the present study, the most common isolated species was *T. mentagrophytes* (19.17%), followed by *T. tonsurans* (17.12%), *T. verrucosum* (11.3%), *T. schoenlenii* (8.21%). Other spp were *M. ferrugineum* (7.87%), *E. floccosum* (3.08%), *M. audouinii* (5.47%) *T. soudanense* (5.82%), *T. rubrum* (3.08%), *Candida* 10.6%, Our findings are similar to a study of dermatophytoses in South West of Iran where *T. mentagrophytes* was most prevalent spp. Followed by *E.floccosum*¹⁷.

In our study *T. mentagrophytes* was isolated from every type of presentation, most commonly from cases of *T. corporis* (18), followed by *T. capitis* (11) and *T. unguium* (6). The distribution of *T. mentagrophytes* in suburban and rural cases was 37 and 19 respectively.

Conclusion:

This study was conducted to evaluate distribution of various dermatophytes among suburban population at Lucknow. The spectrum of various fungi causing superficial mycosis has not been recently documented from our region and treatment is empirical. Therefore, the present study was undertaken to describe the prevailing spectrum and frequency of various fungal isolates causing dermatophytosis along with their distribution among suburban population. Our study has revealed a strikingly different local dermatophytic flora in our region compared to the rest of the country. This signifies the importance of epidemiological studies to be conducted at regular intervals.

Competing Interest: None declared

Funding: Nil

Table 1: Distribution of cases according to age group

| Age (yrs) | Cases | T. capitis | | T. corporis | | T. pedis | | T. manuum | | T. unguium | | T. faciei | | T. cruris | | T. ped. + T. ung. | | T. ung.+ T. man. | | T. cap.+ T. cor. | | PV | | Male | Female | M: F | |
|-----------|-------------|------------|----|-------------|----|----------|---|-----------|---|------------|----|-----------|---|-----------|---|-------------------|---|------------------|---|------------------|---|----|----|-------------|------------|---------|-------|
| | | n= | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | n (%) | n (%) | Ratio |
| 0-10 | 60 (15%) | 24 | 20 | 6 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 32 (8%) | 28 (7%) | 1.1:1 |
| 11-20 | 71 (17.75%) | 6 | 10 | 10 | 8 | 0 | 0 | 0 | 2 | 6 | 4 | 2 | 2 | 2 | 0 | 2 | 0 | 4 | 0 | 2 | 0 | 7 | 4 | 55 (13.7%) | 16 (4%) | 3.4:1 | |
| 21-30 | 97 (24.25%) | 10 | 10 | 16 | 4 | 2 | 2 | 4 | 2 | 8 | 4 | 6 | 0 | 6 | 0 | 4 | 0 | 2 | 0 | 4 | 0 | 8 | 5 | 75 (18.75%) | 22 (5.5%) | 3.4:1 | |
| 31-40 | 57 (14.25%) | 4 | 4 | 8 | 0 | 8 | 0 | 2 | 0 | 8 | 4 | 0 | 2 | 2 | 2 | 2 | 0 | 2 | 0 | 2 | 0 | 5 | 2 | 45 (11.25%) | 12 (3%) | 3.75:1 | |
| 41-50 | 46 (11.5%) | 6 | 4 | 6 | 4 | 4 | 0 | 2 | 0 | 6 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 2 | 32 (8%) | 14 (3.5%) | 2.3:1 | |
| 51-60 | 37 (9.25%) | 0 | 2 | 4 | 2 | 2 | 2 | 4 | 2 | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 1 | 24 (6%) | 13 (3.25%) | 1.8:1 | |
| 61-70 | 22 (5.5%) | 0 | 0 | 2 | 4 | 0 | 2 | 0 | 2 | 4 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 12 (3%) | 10 (2.5%) | 1.2:1 | |
| 71-80 | 10 (2.5%) | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 (2.5%) | 0 (0%) | 10:0 | |
| Total | n=400 | 50 | 50 | 54 | 26 | 18 | 6 | 12 | 8 | 40 | 20 | 12 | 8 | 10 | 2 | 12 | 0 | 16 | 0 | 12 | 2 | 28 | 14 | 400 | | | |
| | 100% | 100 | | 80 | | 24 | | 20 | | 60 | | 20 | | 12 | | 12 | | 16 | | 14 | | 42 | | 100% | | | |

Table 2: Relationship of superficial mycoses cases according to occupation

| Clinical presentation | No of cases (%) | Unskilled labourers | Skilled persons | Farmer s | Service/ Professionals | Businessmen | House wives | Students | Infants+ Toddlers |
|-----------------------|-----------------|---------------------|-----------------|----------|------------------------|-------------|-------------|----------|-------------------|
| T.capitis | 100 (25) | 4 | 6 | 4 | 4 | 0 | 12 | 58 | 12 |
| T.corporis | 80 (20) | 4 | 14 | 16 | 8 | 4 | 16 | 12 | 6 |
| T.pedis | 24 (6) | 4 | 6 | 6 | 2 | 2 | 4 | 0 | 0 |
| T.manuum | 20 (5) | 2 | 6 | 0 | 0 | 2 | 8 | 2 | 0 |
| T.faciei | 20 (5) | 0 | 0 | 0 | 4 | 0 | 2 | 14 | 0 |
| T.unguium | 60 (15) | 8 | 4 | 14 | 12 | 4 | 4 | 14 | 0 |
| T.cruis | 12 (3) | 0 | 2 | 0 | 4 | 0 | 2 | 4 | 0 |
| T.pedis+ unguium | 14 (3.5) | 2 | 0 | 6 | 2 | 4 | 0 | 0 | 0 |
| T.manuum+ unguium | 16 (4) | 0 | 6 | 4 | 2 | 2 | 0 | 2 | 0 |
| T.capitis+ corporis | 12 (3) | 2 | 4 | 0 | 0 | 0 | 0 | 6 | 0 |
| P.versicolor | 42 (10.5) | 0 | 8 | 2 | 6 | 8 | 10 | 8 | 0 |
| Total (%) | 400 (100) | 26 (6.5) | 56 (14) | 52 (13) | 44 (11) | 26 (6.5) | 58 (14.5) | 120 (30) | 18 (4.5) |

Table 3: Prevalence of Fungal isolates from different clinical presentation of superficial mycoses cases

| Fungal isolates | T. capitis | T. corporis | T. unguium | T. manuum | T. pedis | T. cruris | T. faciei | T. pedis + T. Unguium | T. manuum + T. unguium | T. capitis+ T. corporis | TOTAL | % |
|-------------------|------------|-------------|------------|-----------|----------|-----------|-----------|-----------------------|------------------------|-------------------------|-------|-------|
| T. mentagrophytes | 11 | 18 | 6 | 4 | 4 | 2 | 2 | 3 | 2 | 4 | 56 | 19.17 |
| T. tonsurans | 24 | 10 | 6 | 2 | 2 | 0 | 4 | 0 | 0 | 2 | 50 | 17.12 |
| T. rubrum | 4 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 9 | 3.08 |
| T. soudanense | 7 | 2 | 0 | 0 | 4 | 0 | 0 | 2 | 2 | 0 | 17 | 5.82 |
| T. schoenleinii | 4 | 9 | 2 | 0 | 2 | 0 | 0 | 2 | 5 | 0 | 24 | 8.21 |
| T. verrucosum | 10 | 5 | 10 | 2 | 4 | 2 | 0 | 0 | 0 | 0 | 33 | 11.3 |
| M. ferrugineum | 11 | 3 | 0 | 1 | 0 | 0 | 2 | 2 | 2 | 2 | 23 | 7.87 |
| M. audouinii | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 5.47 |
| E. floccosum | 0 | 4 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 9 | 3.08 |
| C. albicans | 1 | 2 | 4 | 4 | 1 | 1 | 3 | 0 | 0 | 0 | 16 | 5.47 |
| C. non albicans | 1 | 3 | 0 | 4 | 0 | 3 | 4 | 0 | 0 | 0 | 15 | 5.13 |
| Non dermatophytes | 0 | 0 | 12 | 2 | 5 | 0 | 0 | 3 | 2 | 0 | 24 | 8.21 |
| TOTAL | 81 | 66 | 45 | 20 | 22 | 8 | 15 | 12 | 14 | 10 | 292 | 100 |

References:

- Crispin JC, Alcocer-Varela J. Rheumatologic manifestations of diabetes mellitus. *Am J Med* 2003, 114: 753-757.
- Rosenbloom AL, Silverstein JH. Connective tissue and joint disease in diabetes mellitus. *Endocrinol Metab Clin North Am* 1996, 25: 473-483.
- Goldberg BA, Scarlat MM, Harryman DT 2nd. Management of the stiff shoulder. *J Orthop Sci* 1999, 4: 462-671.
- Shulte L, Roberts MS, Zimmerman C et al. A quantitative assessment of limited joint mobility in patients with diabetes. *Goniometric analysis of upper extremity passive range of motion. Arthritis Rheum* 1993, 36: 1429-1443.
- National Research Council. *The Institute of Medicine. Musculoskeletal disorders and the workplace: Low back and upper extremities.* National Academy Press, Washington, DC 2001.
- Stephen JC, Mary FB, Kathryn AW, Mamta AMIN, Ann EB. Inflammatory biomarkers increase with severity of upper-extremity overuse disorders. *Clinical Science* 2007, 112: 305–314.
- Ruminy P, Gangneux C, Claeysens S, Scotte M, Daveau M, Salier JP. Gene transcription in hepatocytes during the acute

- phase of a systemic inflammation: from transcription factors to target organ. *Inflamm Res* 2001, 50: 383–390.
8. Wellen KE, Hotamisligil GS. Inflammation, stress, and diabetes. *J Clin Invest* 2005, 115: 1111–1119.
 9. Morris MF: Insulin receptor signalling and regulation. In textbook of Diabetes. 3rd ed. Picup JC, Williams G, Eds. Oxford, U.K., Blackwell 2003, 14.1- 14.17.
 10. Pickup JC, Mattock MB, Chusney GD, Burt D. NIDDM as a disease of the innate immune system: association of acute-phase reactants and interleukin-6 with metabolic syndrome X. *Diabetologia* 1997, 40:1286-1292.
 11. Kern PA, Ranganathan S, Li CL, Wood L, Ranganathan G. Adipose tissue tumor necrosis factor and interleukin-6 expression in human obesity and insulin resistance. *American Journal of Physiology-Endocrinology and Metabolism* 2001, 280:745-751.
 12. Rai KB, Pattabiraman TN. Glycosylated haemoglobin levels in iron deficiency anaemia. *Indian J Med Res* 1986, 83: 234-6.
 13. Vazquez G, Duval S, Jacobs DR JR, Silventoinen K. Comparison of body mass index, waist circumference and waist/hip ratio in predicting incident: a meta-analysis. *Epidemiol Rev* 2007, 29: 115-128.
 14. Nyamdroj R, Qiao Q, Lam TH, Tuomilehto J, Ho SY, Pitkaniemi J, Nakagami T, Mohan V, Janus ED, Ferreira SR. BMI compared with central obesity indication in relation to diabetes and hypertension in Asians. *Obesity (Silver Spring)* 2008, 16: 1622-1635.
 15. Arnlov J, Sundstrom J, Ingelsson E, Lind L. Impact of BMI and the metabolic syndrome on the risk of Diabetes in middle-aged men. *Diabetes Care* 2011, 34: 61-65.
 16. Suji G and Sivakami S. Glucose, glycation and ageing. *Biogerontology* 2004, 5: 365-373.
 17. Sheetz MJ, King GL. Molecular understanding of hyperglycemia: adverse effects for diabetic complications. *JAMA* 2002, 288: 2579-2588.

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