Clinico-pathological assessment of common medical liver diseases-

Fatty Liver Disease

Judy Wyatt
And
Mervyn Davies
Fat and the liver

- Hepatocytes use lipid (membranes, bile, energy metabolism) but do not normally store it.
- In fatty liver disease, stored triglyceride = steatosis.
- A small amount of fatty change is very common - not considered pathological if <5% hepatocytes.

- Fatty liver disease = includes steatosis and steatohepatitis and cirrhosis.
  - Alcoholic liver disease (ALD) or non-alcoholic fatty liver disease (NAFLD).

- Steatohepatitis = metabolic injury, leading to fibrosis and cirrhosis.
  - Alcoholic steatohepatitis (ASH) and non-alcoholic steatohepatitis (NASH).
## Clinico-Pathological Diagnosis

Biopsies with fatty change

<table>
<thead>
<tr>
<th></th>
<th>Steatosis</th>
<th>Steatohepatitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>alcoholic</td>
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<tr>
<td>Non-alcoholic</td>
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</table>
Fatty liver disease is very common – who should have a biopsy?

Estimated prevalence up to 44% in Europe*

Clinical diagnosis based on:

- Abnormal liver enzymes – can be normal
- Fatty liver on ultrasound
- Aetiology from clinical history and examination

Why would you do a biopsy??

- Suspect severe/advanced fatty liver disease
  - non-invasive liver screen
- Exclude an additional / alternative diagnosis
- Medication such as methotrexate

*Blachier M et al. J Hepatol 2013;58;593-608
The spectrum of fatty liver disease

Case 1. Steatohepatitis - diagnosis and severity

Case 2. Cirrhosis, alcoholic steatohepatitis

Case 3. Steatosis
Case 1. JSF b 1961 Age 53, F

- Referred for abnormal LFTs to St. James’s Hospital in November 2014

- **Background**
  - Obesity (BMI 32)
  - Moderate Alcohol consumption (14 units/week)
  - Diet controlled type 2 diabetes, no complications
  - Married with 3 kids
  - Takes lansoprazole
1. JSF – Aged 53

- ALT 152 – 186 (<40), AST 110 (<40), AST:ALT ratio 0.6
- Ferritin – 441 (30 – 300) – transferrin sat 28%
- Viral Serology – HBV/HCV negative
- Auto-antibodies –ve: ANA/SMA/LKM/AMA
- Ig’s Normal, ttg – Negative. TFT normal
- Glu - DM  HBA1c good control.
- A-1 AT slightly low, Pi MS heterozygote
- U/S – Bright fatty liver
1. JSF – Aged 53

On examination, occasional spider naevi
Over weight, BMI 32

Lost some weight on a low carbohydrate diet
(South Beach Diet)

• LFTs continued to fluctuate therefore whether to biopsy (to assess pathological process and stage)
• Use non invasive fibrosis scores
Fibroscan and other non invasive measures of fibrosis in NAFLD

In cases where the only question is the extent of fibrosis, then a fibroscan is often used to replace a liver biopsy – eg HCV
Fibroscan

- Non-invasive liver stiffness measurement
- Measures velocity of a low frequency shear wave
- Velocity is directly related to liver stiffness
- Measures a volume of liver 1x4cm at 2.5-6.5cm below skin
- LSM ranges from 2.5-75kPa
Fibroscan and biopsy evaluation of fibrosis
Fibroscan ROC curves
BARD score

<table>
<thead>
<tr>
<th>Points</th>
<th>1 or 2</th>
<th>ZERO</th>
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<tbody>
<tr>
<td>DIABETES</td>
<td>Yes = 1</td>
<td>No = 0</td>
</tr>
<tr>
<td>BMI &gt;28</td>
<td>Yes = 1</td>
<td>No = 0</td>
</tr>
<tr>
<td>AST/ALT ratio &gt;0.8</td>
<td>Yes = 2</td>
<td>No = 0</td>
</tr>
</tbody>
</table>

A score ≥2 potential for fibrosis positive and negative predictive values of the BARD score for advanced fibrosis were 69% and 96%
NAFLD score

- Age
- Platelets
- Albumin
- Diabetes/impaired glucose tolerance
- ALT
- AST

On line calculator – low risk/intermediate/high

High score (>0.676) positive predictive value for advanced fibrosis (F3-F4) of 82% and a low score (<-1.455) negative predictive value of 88%
ELF Score  European liver fibrosis panel

- Proprietary algorithm
  Age
  Hyaluronic acid level
  PIIIP
  TIMP-1

Threshold score of 0.102 sensitivity of 87 to 90% and specificity of 41 to 51% for moderate or severe fibrosis

Threshold >0.457 specificity 95%.
Scores

• NAFLD score low
• BARD score 2 = intermediate

Therefore proceed to a fibroscan:
Median stiffness 15kpa, with satisfactory quality measures

High ALT and high fibroscan, plan liver biopsy to assess process and stage
Case 1. JSF – Aged 53

- Diagnosis – steatohepatitis, consistent with non-alcoholic steatohepatitis,
- Bridging fibrosis (Kleiner stage 3)
- No evidence of other liver disease
Fibroscan result v. Biopsy stage, NAFLD, 16 recent patients

8/16 patients with fibroscan >10.5 had stage 0-2 fibrosis
Necessary features to diagnose steatohepatitis

AASLD single topic conference NASH Atlanta, 2002

• Necessary components — **must see**
  – Steatosis, Macro>micro, mainly zone 3
  – Mixed mild lobular inflammation
  – Hepatocyte ballooning, most apparent near steatotic cells

• Usually present, not necessary for diagnosis — **often see**
  – Mallory’s hyaline, usually zone 3
  – Perisinusoidal fibrosis (zone 3)
  – Glycogenated nuclei (zone 1)
  – Lipogranulomas (usually small)
  – Occasional apoptotic hepatocytes/PASD+ve Kupffer cells

• May be present, not necessary for diagnosis — **may see**
  – Mild siderosis,
  – Megamitochondria

• Not present in NASH — **don’t see** = something else as well
  consider other causes of liver disease

Next slide

Unusual for NASH, consider other causes of liver disease instead/as well

– Sclerosing hyaline necrosis
  = severe pattern of steatohepatitis seen in alcoholic liver disease

– Portal inflammation > lobular inflammation in early stage disease
– Lymphoid aggregates, plasma cells

– Significant eosinophils, granulomas
– Portal/periportal fibrosis much greater than zone 3 fibrosis
– Lobular disarray

– Acute cholestasis, bile plugs
– Chronic cholestasis, copper associated protein

– Significant iron, evidence of alpha 1 antitrypsin deficiency

Staining for keratins 8/18 improves detection of hepatocyte injury in NAFLD

- More sensitive and specific for fibrogenic hepatocellular injury than H&E staining

- 40 biopsies from NASH CRN database study for no steatohepatitis (18): suspicious (7): definite (15) steatohepatitis

Results:
- 2 NASH weren’t
- 5/7 suspicious were no-NASH
- Improved inter-observer agreement on NASH
- Correlates with insulin resistance

Guy CD et al. *Human Pathology* 2012;43;790-800
How much portal inflammation/fibrosis in steatohepatitis?

When to suspect an additional cause of chronic liver disease?

• Clinicians suspect –
  – another cause of liver disease in liver screen,  
    e.g. Autoantibodies, high ferritin, cholestatic LFTs
  ? Look for features of these in the biopsy  
    Up to 30% NAFLD have liver autoantibodies, usually low titre

• Pathologists suspects –
  – Disproportionate portal tract inflammation, definite interface hepatitis
  ? Ask about autoantibodies, Ig level, hepatitis C
  – Any copper associated protein in non-cirrhotic biopsy
  ? Ask about autoantibodies, cholestatic liver function tests

• Portal inflammation in NASH is predictor of fibrosis progression
Can the pathologist distinguish ASH from NASH?

<table>
<thead>
<tr>
<th></th>
<th>Steatosis</th>
<th>or</th>
<th>Steatohepatitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>either</td>
<td>&gt;5% hepatocytes with steatosis, without features of steatohepatitis</td>
<td>Steatosis</td>
<td>Steatosis Inflammation</td>
</tr>
<tr>
<td>alcoholic</td>
<td></td>
<td></td>
<td>Ballooned hepatocytes</td>
</tr>
<tr>
<td>Non-alcoholic</td>
<td></td>
<td></td>
<td>+/- Mallory-Denk bodies,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>pericellular fibrosis</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>More fibrosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>More Mallory-Denk bodies</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Polymorphs</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Cholestasis</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Glycogenated nuclei</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>More steatosis v. other features</td>
</tr>
</tbody>
</table>
How bad is it?

Stage:

1 perisinusoidal (1a, 1b) or periportal (1c)
2 peri-sinusoidal and portal/periportal
3 bridging fibrosis
4 cirrhosis

How bad is it? NAS activity score (0-8)

grade = sum of steatosis, lobular inflammation and ballooning

- Steatosis (0-3)
- Lobular inflammation (0-3)
- Hepatocyte ballooning (0-2)

Make diagnosis of steatohepatitis first,
Then grade severity
(not use activity score to make diagnosis of steatosis v steatohepatitis)

But not necessary in routine practice

Scoring system for evaluation of liver lesions in morbidly obese patients

Steatosis, Activity, Fibrosis (SAF) score
- Steatosis (0-3), Fibrosis (0-4), scored as NASH-CRN (Kleiner 2005)

- Activity score = combined scores for ballooning (0-2) and inflammation (0-2)

- Activity score ≥2 closely correlated with original histological diagnosis of NASH, and with serum AST and ALT and fibrosis

Bedossa P et al Hepatology 2012;56;1751-1759
Scoring system for evaluation of liver lesions in morbidly obese patients

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- Activity score ≥2 closely correlated with original histological diagnosis of NASH, and with serum AST and ALT and fibrosis

Natural history of NASH:

Initially steatosis – protective, non-progressive
May → Metabolic cell injury – hepatocyte damage and senescence
Increasing fibrosis and nodular regeneration, decreasing steatosis

*Bedossa P et al Hepatology 2012;56;1751-1759*
Utility and appropriateness of the Steatosis, Activity and Fibrosis (SAF) score in biopsies of NAFLD

• Criteria as for NAS score, but not a-c for stage 1

• Binary classification into NASH or no-NASH is simplistic – continuous spectrum of disease.

• Improved reproducibility for specialists and less-specialists

Bedossa and FLIP pathology consortium. *Hepatology* 2014;60;565-575
The spectrum of fatty liver disease

Case 1. Steatohepatitis - diagnosis and severity

Case 2. Cirrhosis, alcoholic steatohepatitis

Case 3. Steatosis
Case 2: AA – aged 33

- Male, born in Slovenia 1981
- Healthy childhood
- Elite athlete – joined the military development squad
- IV anabolic steroids
- Continued to compete at a high level
Case 2: AA continued

- Commenced heroin and amphetamine 1990s
- Migrated to UK 2009
- Clean of illicit drugs since 1999
- August 2011 admission with acute alcoholic hepatitis
- Screening positive for HCV PCR + Genotype 3a
- Previous hepatitis B – immune (sAg –ve, cAb+) and HIV -ve
Case 2: AA continued

- Too high risk currently for anti viral therapy
- Appearing dishevelled, but confident he can stop all alcohol
- July 2012 – “not drinking” ALT 121, bilirubin 46, plan liver biopsy pre-treatment
- Biopsy – steatohepatitis, presumed to be alcohol.

Not for anti viral therapy MUST STOP alcohol
Case 2: AA continued

- Therapy deferred

Referral to alcohol team
Good progress and rapidly achieved abstinence

Patient requested review at viral hepatitis clinic
Case 2: AA continued

- Attended follow up,
Keen again on anti viral therapy – patient denies drinking alcohol
Liver function stable
Plan to proceed with anti viral therapy:
Commenced PEG IFN/Ribavirin
Week 6 became jaundiced – biopsy ? Toxic drug reaction or relapse of alcohol
Case 2
Case 2: AA – aged 33

- Diagnosis:
  - Cirrhosis, alcoholic steatohepatitis
  - Little if any evidence of hepatitis C contributing
  - Not drug induced liver injury
Cirrhosis, Acute alcoholic hepatitis

Biopsy to confirm the diagnosis,
Distinguish from other causes of acute liver failure

Can it tell us anything else?
Histology reflects acute reversible deterioration from inexorable decline in late stage of alcoholic cirrhosis.
Early features of acute-on-chronic liver failure: a prospective cohort study

Patients with alcoholic cirrhosis and liver failure (n=102)

Acute on chronic liver failure v Chronic hepatic decompensation

High hospital mortality for ACLF

Ductular bile plugs
Clinical markers of SIRS
Predict sepsis and reversibility in patients with ACLF.

Katoonizadeh A et al Gut 2010;59;1561-9
A histological scoring system for prognosis of patients with alcoholic hepatitis

Transjugular biopsy in patients with acute alcoholic hepatitis

Bridging or cirrhosis  +3
Canalicular/ductular  +1 or 2
Mild poly infiltration  +2
No megamitochondria  +2

90 day mortality 3%,19%,51%
Score 0-3, 4-5, 6-9

Editorial:
Validated scoring in acute ALD – AHHS,
Adds to clinical scoring for milder disease
Not yet ready for routine use

Altamirano J et al. Gastroenterology 2014;146;1231-1239
Variation in liver biopsies on my desk.....
Improved tissue sections for medical liver biopsies: a comparison of 16G v 18G biopsy needles.

Bradford = 18G, usually 2 passes
Leeds = 16G, single pass
same laboratory – how good are the sections?

Illustrating median area of tissue sections

<table>
<thead>
<tr>
<th></th>
<th>18G (n=49)</th>
<th>16G (n=41)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% intact</td>
<td>29%</td>
<td>76%</td>
</tr>
<tr>
<td>Max diameter Median</td>
<td>0.74mm</td>
<td>1.04mm</td>
</tr>
<tr>
<td>Average diameter Median</td>
<td>0.53mm</td>
<td>0.87mm</td>
</tr>
<tr>
<td>Average area per pass median</td>
<td>8.3mm²</td>
<td>11.4mm²</td>
</tr>
</tbody>
</table>

P<0.001 for all

Size of biopsy

RCPath Tissue Pathways – 16G needle, 1 core >15mm long is sufficient, >6 portal tracts

Portal tracts
9/111 (8%) of cores had <6 portal tracts per section
All biopsies > 16mm in length when taken contained 6 or more portal tracts
The number of portal tracts per cm of biopsy is very variable and therefore cannot be predicted from the length of core at biopsy R=0.23

Halas R et al, ESP meeting September 2014
Case 2: AA continued

- Rx with prednisolone for acute alcoholic hepatitis
  Good response
  Anti viral therapy discontinued
  Monitor for complications of cirrhosis
  Attends alcohol nurse
Case 2: AA continued
The spectrum of fatty liver disease

Case 1. Steatohepatitis - diagnosis and severity

Case 2. Cirrhosis, alcoholic steatohepatitis

Case 3. Steatosis
Case 3 JES 25.08.1958 age 54

- September 2012 – dermatology clinic, aged 54
  - Severe psoriasis
Previous good response to ciclosporin, which was then weaned
Now psoriasis breaking through
Multiple topical agents unhelpful
Restart ciclosporin
Case 3 JES - continued

- Developing side effects from ciclosporin
  Psoriasis troublesome
  Consider methotrexate – but abnormal liver function tests, SMA + and elevation of PIIINP

- Referral to hepatology
Case 3 JES - continued

- Non invasive scores:
  BARD
  NAFLD
  ELF
  PIIINP
  Fibroscan

- This lady has a mix of risk factors for chronic liver disease
Case 3 JES - continued

• Obese BMI 33.2
• No risk factors otherwise for chronic liver disease – alcohol never heavy 7 units per week

On examination no signs of liver disease, liver feels unremarkable

USS - fatty liver and gallstone, slightly wide calibre CBD

MRCP – no stones
Case 3 JES - continued

• BARD, NAFLD & Fibroscan scores low
HBV HCV negative
SMA positive, LKM, ANA and AMA and Ig’s normal, tTg –ve,
Ferritin normal. A-1 AT normal, Glu and HBA1c normal. TFT normal

But, team want to use methotrexate, LFT elevated, SMA +, high PIIINP
Case 3 JES - continued

• If Steatohepatitis present, then Methotrexate best avoided
• Also issue of SMA positivity

Biopsy:
Diagnosis:
Steatosis, no evidence of steatohepatitis

No fibrosis

No evidence of autoimmune hepatitis or biliary disease.
Steatosis - terminology

- Macrovesicular steatosis – one large droplet displacing nucleus or several small droplets

- Purely microvesicular steatosis – rare, severe, urgent – e.g. acute fatty liver of pregnancy, Reye’s syndrome, alcoholic foamy degeneration

Yeh MM, Brunt EM. Diagnostic Histopathology 2008;14(12)586-597
Fatty liver disease: alcohol, non-alcoholic, also drugs causing fatty liver disease

• Cause steatohepatitis directly
  – Amiodarone, irinotecan, ?methotrexate

• Promote steatohepatitis in patients with other risk factors
  – Tamoxifen, methotrexate, steroids,

• Association with steatosis
  – Steroids, 5FU, Brufen, anti-TB drugs, spironolactone

Ramachandran R & Kakar S. J Clin Pathol 2009;62;481-492
Summary

Can’t biopsy everyone with ? Fatty liver disease......
Not every obese patient has fatty liver disease

Purpose of biopsy: guide clinical management when non-invasive tests are insufficient:
- clinical question must be on the request form

1. Establish diagnosis – necessary features present
   +/- features of other disease

2. and assess severity – stage fibrosis (not = Ishak)
   - grade - steatosis
     - inflammation/ballooning (K8/18)

3. Consider aetiology – needs clinical information
   especially alcohol history
The challenge of obesity
Obesity Trends* Among U.S. Adults

BRFSS, 1985

(*BMI ≥30, or ~30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 1990

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 1995

(*BMI \geq 30, or \sim 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 2000

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 2005

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2010

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1990, 2000, 2010
(*BMI ≥30, or about 30 lbs. overweight for 5’4” person)
Prevalence of Obesity Among U.S. Adults Aged 20-74

Derived from NHANES data (http://www.cdc.gov/nchs/data/hestat/obesity_adult_09_10/obesity_adult_09_10.html#table1)
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<th>Race/Ethnicity</th>
<th>Percent</th>
<th>Margin of Error (+/-)</th>
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<td>Asian</td>
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<td>White</td>
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<td>3</td>
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<td>Hispanic</td>
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<td>4</td>
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<tr>
<td>Black</td>
<td>29</td>
<td>7</td>
</tr>
<tr>
<td>Native Hawaiians/Other Pacific Islander</td>
<td>33</td>
<td>12</td>
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<tr>
<td>American Indian/Alaska Native</td>
<td>34</td>
<td>7</td>
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<tr>
<td>Household Income</td>
<td>Percent</td>
<td>Margin of Error (+/-)</td>
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<td>------------------------</td>
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<tr>
<td>Less than $35,000</td>
<td>31</td>
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<td>2</td>
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<tr>
<td>$75,000 or more</td>
<td>21</td>
<td>3</td>
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<tr>
<td>Educational Level</td>
<td>Percent</td>
<td>Margin of Error (+/-)</td>
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<tr>
<td>High School or Less</td>
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<tr>
<td>Some College</td>
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<tr>
<td>College Graduate or More</td>
<td>20</td>
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</table>
Prevalence of Self-Reported Obesity Among Non-Hispanic White Adults, by State and Territory, BRFSS, 2012-2014

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.
Prevalence of Self-Reported Obesity Among Hispanic Adults, by State and Territory, BRFSS, 2012-2014

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.
Prevalence of Self-Reported Obesity Among Non-Hispanic Black Adults, by State and Territory, BRFSS, 2012-2014

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.
Trends for Obesity (BMI>30) rates in UK and Ireland

![Graph showing trends in obesity rates in UK and Ireland](image-url)
Trends for Obesity (BMI>30) rates in UK and Ireland
International comparison of obesity rates

<table>
<thead>
<tr>
<th>Country</th>
<th>Measured Data</th>
<th>Self Reported Data</th>
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<tbody>
<tr>
<td>Japan</td>
<td>3.5% (2010)</td>
<td></td>
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<tr>
<td>Korea</td>
<td>4.1% (2010)</td>
<td></td>
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<tr>
<td>Switzerland</td>
<td>8.1% (2007)</td>
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<tr>
<td>Norway</td>
<td>10% (2008)</td>
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<tr>
<td>Italy</td>
<td>10.3% (2010)</td>
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<tr>
<td>Netherlands</td>
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<td>Austria</td>
<td>12.4% (2006)</td>
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<tr>
<td>Sweden</td>
<td>12.9% (2010)</td>
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<tr>
<td>France</td>
<td>12.9% (2010)</td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>13.4% (2010)</td>
<td></td>
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<tr>
<td>Belgium</td>
<td>13.8% (2008)</td>
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<tr>
<td>Ireland</td>
<td>14% (2007)</td>
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<td>Germany</td>
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<td>Slovak Republic</td>
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<td>Portugal</td>
<td>15.4% (2006)</td>
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<tr>
<td>Finland</td>
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<td>Spain</td>
<td>16% (2009)</td>
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<td>Turkey</td>
<td>16.9% (2010)</td>
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<tr>
<td>Greece</td>
<td>17.3% (2009)</td>
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<tr>
<td>Canada</td>
<td>17.5% (2010)</td>
<td></td>
</tr>
<tr>
<td>Iceland</td>
<td>21% (2010)</td>
<td></td>
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<tr>
<td>Czech Republic</td>
<td>21% (2010)</td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td>22% (2011)</td>
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</tr>
<tr>
<td>Northern Ireland</td>
<td>23% (2011)</td>
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<tr>
<td>Luxembourg</td>
<td>23.5% (2011)</td>
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<tr>
<td>Australia</td>
<td>24.6% (2007)</td>
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<tr>
<td>England</td>
<td>24.8% (2011)</td>
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</tr>
<tr>
<td>Scotland</td>
<td>27.7% (2011)</td>
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<tr>
<td>New Zealand</td>
<td>27.8% (2009)</td>
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<tr>
<td>Hungary</td>
<td>28.5% (2009)</td>
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<tr>
<td>Mexico</td>
<td>30% (2006)</td>
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<tr>
<td>United States</td>
<td>35.9% (2010)</td>
<td></td>
</tr>
</tbody>
</table>
UK changing obesity rates with age
UK Childhood obesity and deprivation index

![Bar chart showing obesity prevalence by deprivation level and year for Year 6 and Reception students.](chart.png)
UK obesity rates and educational achievement

![Bar chart showing obesity prevalence by level of education and gender](chart.png)
Trends for smoking rates in UK

- **Males**
- **Females**

<table>
<thead>
<tr>
<th>Year</th>
<th>Males (%)</th>
<th>Females (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td>1986</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>2002</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>2013</td>
<td>20%</td>
<td>10%</td>
</tr>
</tbody>
</table>